the OIL AND GAS JOURNAL

AUGUST 27, 1956

Venezuelan Winners Move In

Early drilling seen as preliminaries get under way. Bidders paid bonuses of upward of $2,600 per acre for national reserves offsetting prolific production.

p. 62

Water Floods Pep Up Old Fields

Here, in a four-article report, is told how five projects have bumped production up to fiftyfold.

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Radioisotopes Find the Answers

Three tests at Esso Standard's Baltimore plant proved that this tool works where others failed.

p. 99

Has Sinclair Uncovered Another Apache? p. 157

In the market for a header with cold extruded outlets?

The new FLUOR-FORMED *cold extrusion* process for producing header and vessel branch outlets by flowing unheated steel around the contours of a die offers many proven advantages over all other methods.

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A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

There is growing concern in the geological profession about premature entry of experience-shy oil finders into the consulting field.

Some college graduates are going directly from final examinations into a consulting status. Other unqualified, self-professed geologists are setting up "consulting" offices. "This is giving the profession a black eye through bad recommendations," says one veteran consultant. The situation seems worst in the Rocky Mountains.

Look for geological leaders to take action in the near future to tighten requirements or caution the industry about unqualified rockhounds.

The antifreeze market, supplied indirectly by petrochemicals in the form of ethylene glycol and methanol, accounted for about 110 million gallons last year. Of this, 79 million gallons was in the permanent type antifreeze, with the alcohol types amounting to 31 million. Total value was estimated at $280 million.

A number of committees interested in oil will swing into action in advance of the 1957 session of Congress.

Among those with matters pending on which they would like to get a head start are the House judiciary, commerce, and ways and means committees. Possible subjects are company-dealer relationships in the oil industry, overturn of the Supreme Court decision in the "Detroit" good-faith case, and advance notification of corporate mergers and taxes.

A new program for expanding oil-country tubular-goods production may be announced by the Government in the near future.

At least two steel companies have plans to build new, big pipe plants if they can get quick write-off of investment for tax purposes. Tubular goods and alkylate currently appear to be the "sensitive" spots in the outlook for oil.

Iraqi officials reportedly are cool toward talk of Kuwait-Iraq-Turkey pipeline to Mediterranean.

They argue the Suez problem will be settled before the line could be built. International oil companies are doing nothing to breathe life into such a project at the moment.

Proposed nearly 2 years ago, the line originally was conceived as a way to break the Syria-Lebanon stranglehold on pipeline movements of Middle East crude.

If a remote wildcat now being drilled at Monkman Pass, 100 miles south of Fort St. John in northeastern British Columbia, should hit, a vast new oil area could open up to exploration.

The well is Peace River Petroleums Ltd., Richfield Oil Corp., and Cie. Francaise des Petroles No. 1 Grizzly Valley, a 12,000-ft. test. Seismic survey revealed an anticline 20 miles long and 2 miles wide. If the usual B.C. success ratio of one producer for every two wells drilled holds true, there is a good chance for an important new discovery in the rugged mountain country of the southern Peace River region.

the OIL AND GAS JOURNAL

AUGUST 27, 1956 • VOLUME 54 • NUMBER 69

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave
Phone Diamond 3-6291

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Ted A. Armstrong — News Editor
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Jo Jeanne Speaker — Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber — Refining Editor
Paul Swain — International Editor
Ray G. Gibson — District Editor

HOUSTON OFFICE
602 Sterling Building
Phone CApitol 4-7726

Larry Resen — District Editor
Ed McGhee — District Editor
Joe Reilly — District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone STerling 3074

Robert J. Enright — District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont — District Editor
William T. Smith — District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz — District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

The Oil and Gas Journal, Published Mondays, copyright 1956, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

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Drilling-Production

SPECIAL WATER-FLOODING REPORT **82-96**

Five-Spot Water-Flood Unit Ups Production Sharply **82**

By Ward M. Edinger

Water flooding Northwest Tyron field, Lincoln County, Oklahoma, has resulted in a monthly increase in production of 38,000 bbl., and it is estimated that another 40,000 bbl. per month can be recovered from the reservoir.

8½ Million Extra Barrels of Oil in 6 Years **86**

By Z. Z. Hunter

Water flooding the North Burbank unit, Osage County, Oklahoma, has resulted in a net increase of 12,500 bbl. of oil production daily. Here is what happened when naturally oriented fractures developed in a water flood.

Water Flood Ups Production Twelvefold in Kentucky **90**

By Arthur C. Simmons

Low oil saturation of analyzed cores made this nearly depleted sand a poor water-flood prospect. But experimental flooding showed it could be revived. Resultant field-wide water flooding has been very efficient.

Water Flooding Pays Off in Kansas **94**

By Jack P. Powell

Here are two case histories of water-flooding projects in Butler County, Kansas. One project is El Dorado field, operated by Cities Service Oil Co., and the other is Blankenship-Sallyards pool, operated by Tidewater Oil Co.

Rimrock Tidelands Rig Is Efficient, Has Space Economy **105**

By Ed McGhee

The company's new offshore rig is well designed so that rig elements are most efficiently placed in the limited available space. Yet it is so flexible that down time can be kept to a bare minimum.

Modern Drilling **123**

Pipelining

Computers Speed Gas-Compressor Calculations **113**

By Dean P. Johnson and Fred E. Culvern

Here's how an electronic computer can be used to calculate performance of compressor equipment and present that data in the form of curves for ready use by operating personnel.

Pipeline Patrol **129**

Sky hook protects tank painters; here's more about O-rings; how new type of thermometer well works; repairs made on epoxy resin; A.S.C.E. adds new pipeline division.

Refining-Processing

Radioisotopes Help Solve Refinery Problems **99**

By George Weber

Part 1 of a four-part series on this important subject. Esso Standard Oil Co. has used radioisotopes on three different occasions at its Baltimore refinery. Tests are fast, accurate, and safe.

Cost-imating **120**

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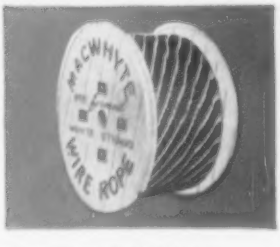

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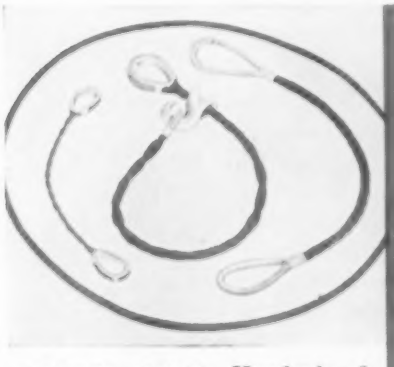

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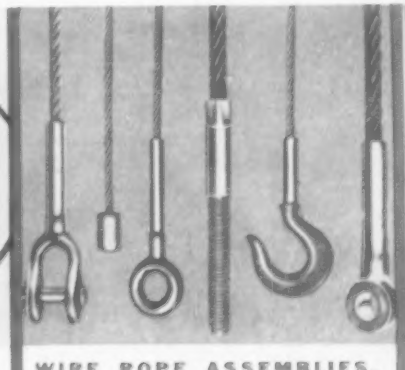

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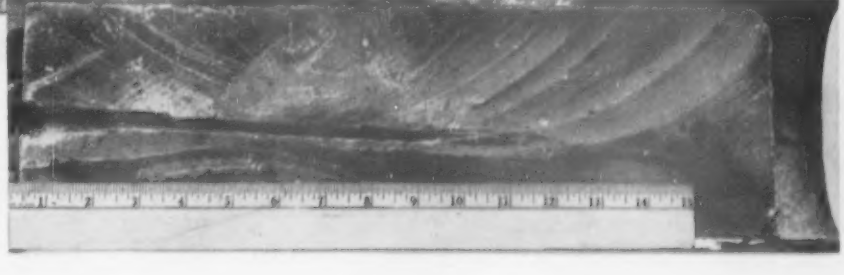

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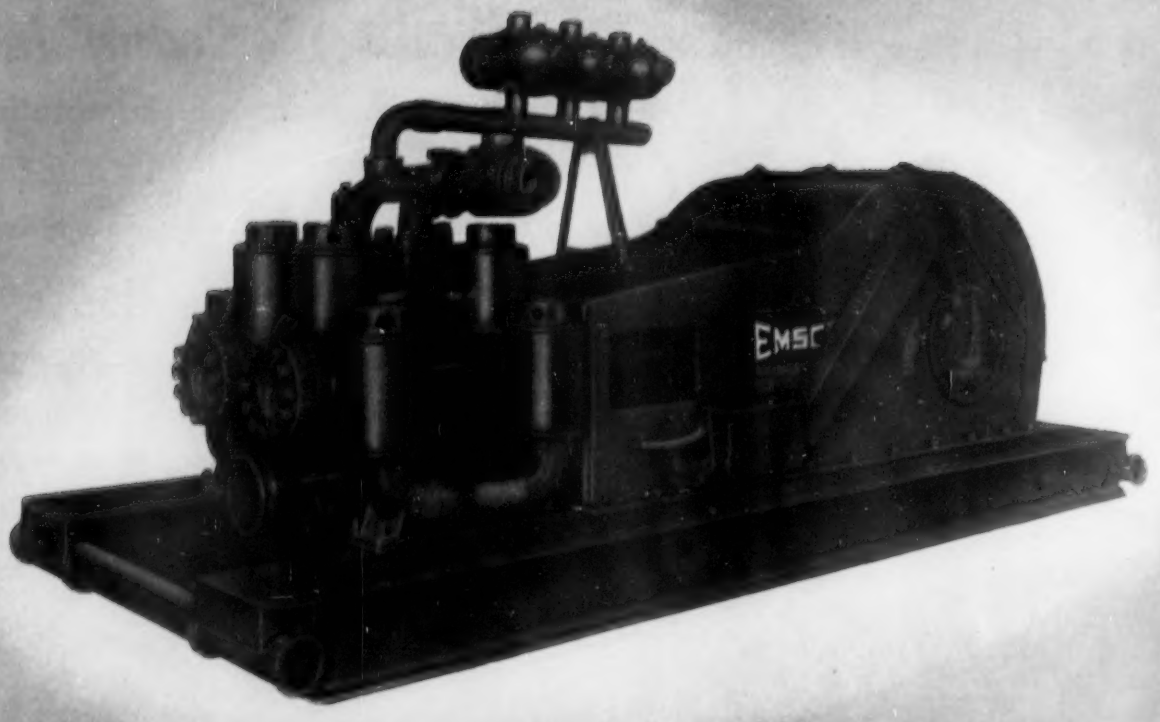

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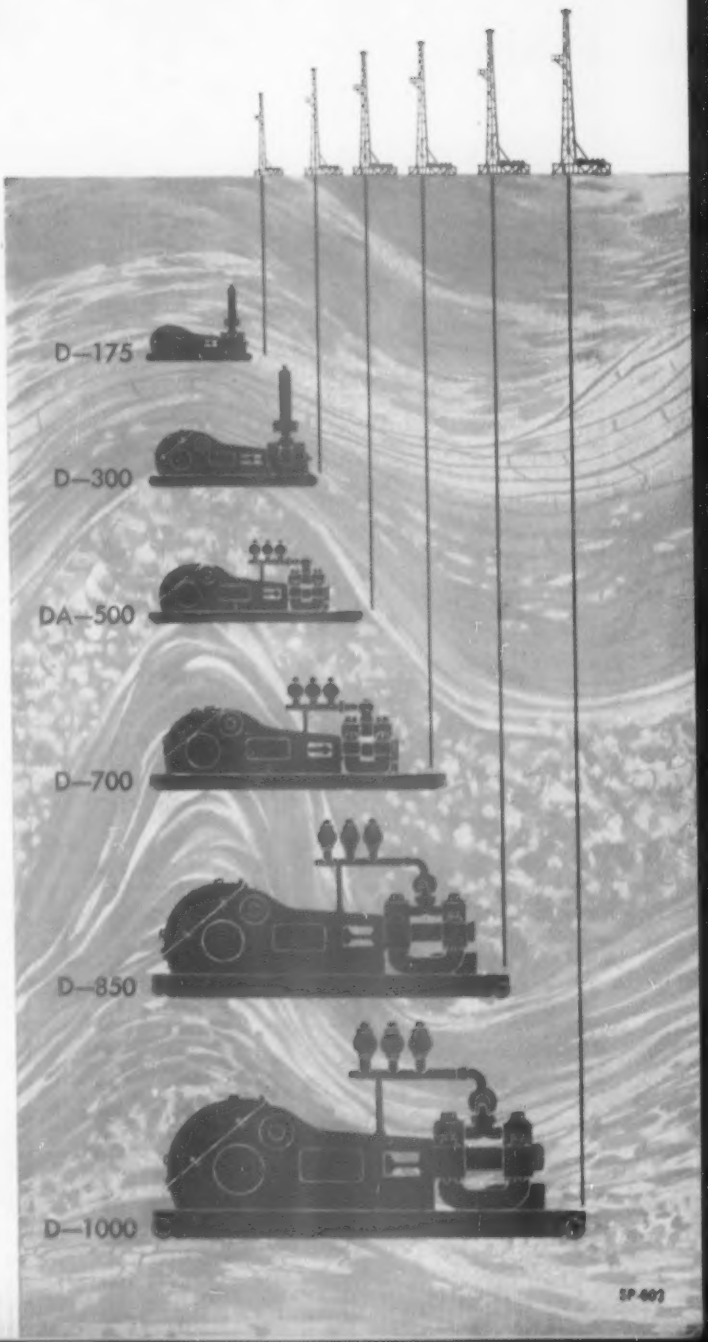

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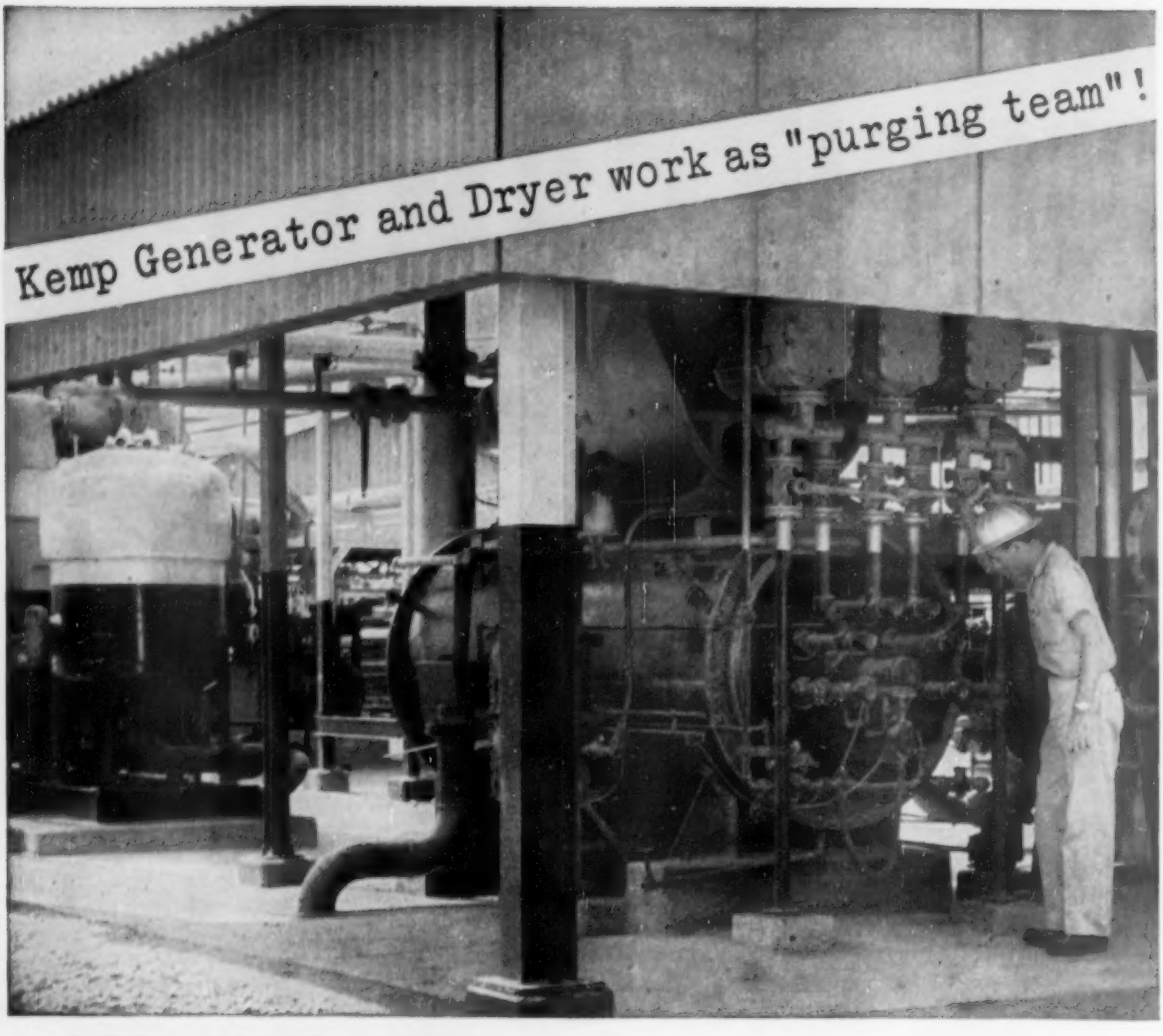

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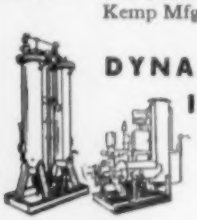

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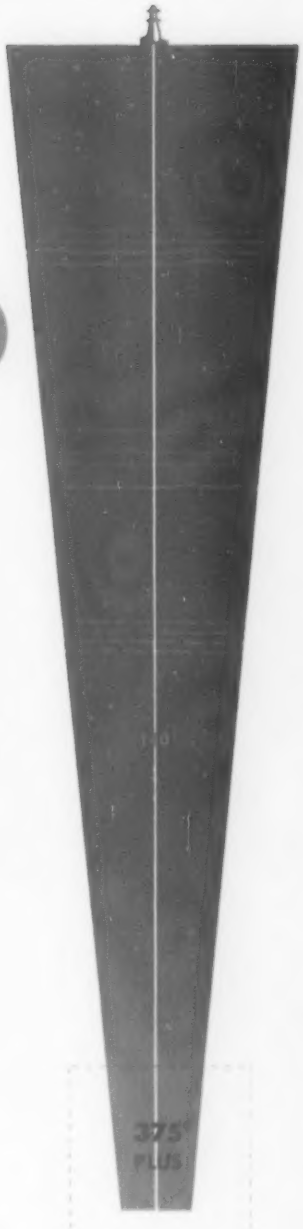

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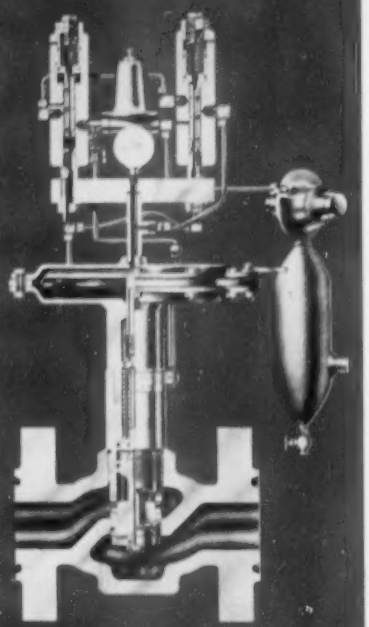

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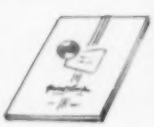
Write For Literature

For further information, write to either company, or ask your GOT or A-1 representative.



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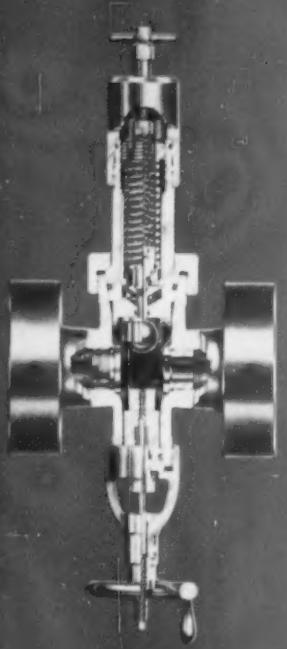


A-1 Standard Safomatic Valve. Direct controlled by line pressure; closes on pre-selected high or low. Manual re-set. Size, 2", screwed, flanged, Grayloc or Unibolt connections. Operating pressures adjusted easily without removing valve from service.

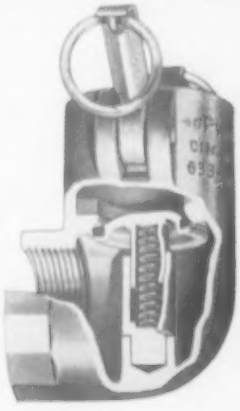
FURNISHED ALSO IN REMOTE CONTROL TYPE, in which controlling pressure is independent of line pressure. Same size, same connections, same pressure ratings as Standard type.

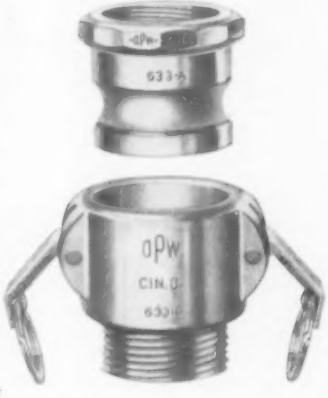
A-1 BIT & TOOL COMPANY

P. O. Box 2133 Houston, Texas

Branch of
Garrett Oil Tools, Inc.

OPW KAMLOK COUPLING ASSEMBLIES





The Fastest Surest Coupling Known!

KAMLOKS positive seal all along the lines assures *greater safety* in handling any type of liquid. A perfectly tight no leak connection is made in seconds by sliding coupler over adaptor, then pressing cam levers, No threads to engage, no twisting friction against gaskets, no tools required. KAMLOKS provide long years of economical trouble free service.

Available in any combination to meet coupling requirements in sizes from ¾" to 4" inclusive. Sizes ¾" through 4" of special hard wear-resistant bronze and OPALUMIN (hi-tensile aluminum alloy requiring no additional heat treating). 1" through 4" of monel. 1" and 2" (633-A and 633-B only) of stainless steel.

Parts A, E, F, are interchangeable with parts B, C, D, G, H, in the same size.

BRONZE • MONEL • ALUMINUM • STAINLESS STEEL

Write for FREE Bulletin F-10

OPW CORPORATION

2731 COLERAIN AVE. • CINCINNATI 25, OHIO

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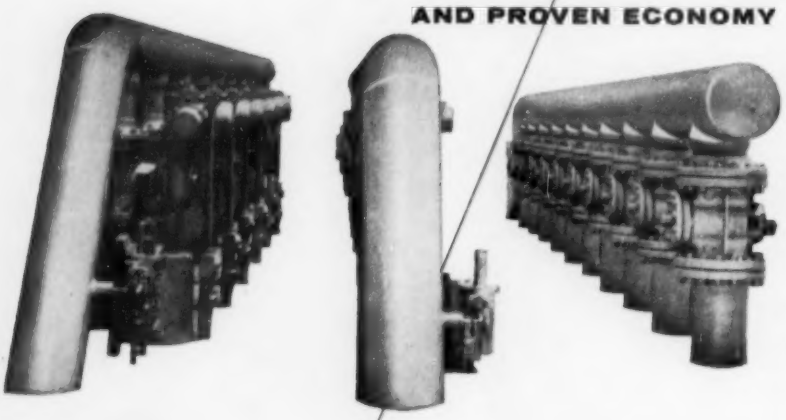
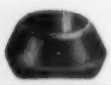
WELDOLETS

FOR ASSURED STRENGTH

AND PROVEN ECONOMY





WELDOLETS

THREDOLETS

SOCKOLETS

Are y o u effecting this economy for your company? Neat and uniform appearance is evident in code constructed weldolet headers in this crude oil pipeline terminal. The money saved is in the bank and does not appear in this picture. If you are not using the weldolet method of cutting piping costs, write today for information.

SOLD THROUGH LEADING DISTRIBUTORS

BONNEY

PENNSYLVANIA DIVISION

BONNEY FORGE & TOOL WORKS

366 GREEN ST., ALLENTOWN, PA.

CUT WELDING FITTING COSTS

You spend 2 to 20 times as much for a welding tee as you do for a Weldolet.

CUT INSTALLATION COSTS

Compared with these methods of branch construction . . .

WELDING TEES

You save line-up and beveling time in addition to welding time by using WELDOLETS.

REINFORCED NOZZLES

You save all shaping and fitting time in addition to a tremendous saving in welding time by using WELDOLETS.

UNREINFORCED NOZZLES

You save all shaping and fitting time by using WELDOLETS.

COUPLINGS

You save all shaping and fitting time and welding time by using THREDOLETS.

SPECIFY AND USE—

Weldolets for branches 2" through 24" on full size and reducing size.

Thredolets or Sockolets for branches ⅛" through 2".

AVAILABLE—

Weights—all through XXS.

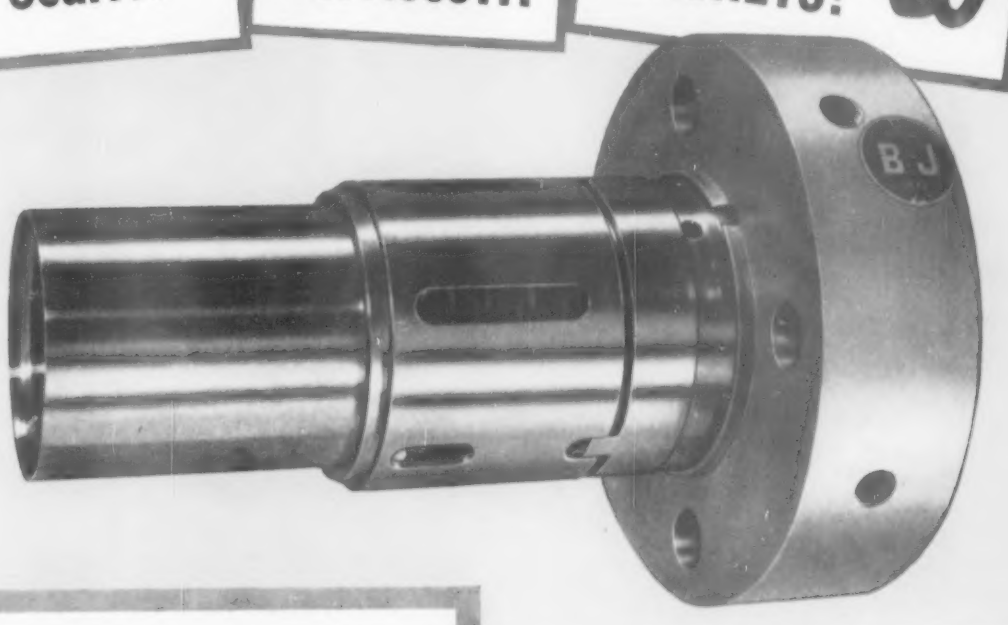
Materials—Carbon
Stainless
Chrome Moly
Wrought Iron
Monel
Copper Nickel
Bronze
Aluminum

Warehousing Distributors in principal cities.

This ONE BJ Mechanical Seal...

Answers THREE Pumping Services...

With only the change of GASKETS!



1 **HIGH OR LOW TEMPERATURES**
The BJ *ASBESTOS* GASKETS handle temperatures from minus 100°F to plus 650°F.

2 **CORROSIVE**
The BJ *TEFLON* GASKETS answer a wide range of corrosive fluids.

3 **HIGH PRESSURE**
The BJ *RUBBER* GASKETS handle pressures to 1000 PSI . . . and any general service needs.

This *one* basic Byron Jackson Type U Mechanical Seal solves *three* major pumping services with only the change of two gaskets. You benefit because: (a) you can *standardize* on this basic BJ Type U Seal and thus greatly reduce your parts and inventory needs; (b) you can convert process pumps to changes of service with only the change of two gaskets; and (c) you *eliminate* costly, troublesome stuffingbox repacking and unnecessary pump downtime.

Only Byron Jackson . . . the leader in Mechanical Seals . . . offers this simplified interchangeability of service through a change of gaskets.

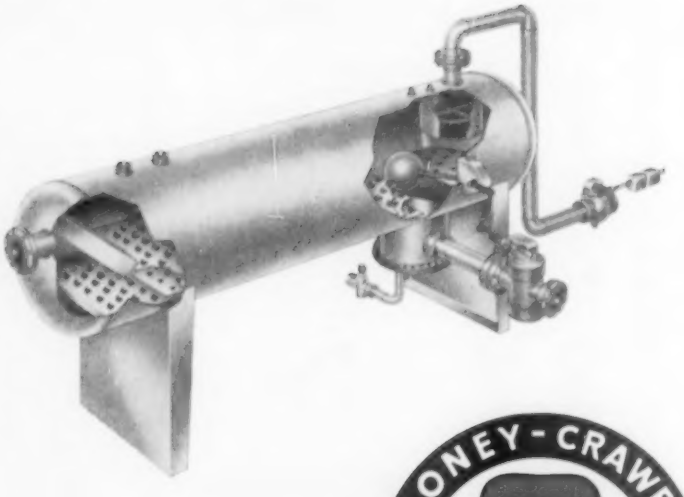
If your operations involve multiple pumps with variations in service requirements, look into this basic BJ Type U Seal. If your pumping needs are more highly specialized in any one field, there's a BJ Mechanical Seal engineered to solve almost every stuffingbox requirement.

FREE MECHANICAL SEAL SELECTION PORTFOLIO—Send for this special Byron Jackson Mechanical Seal Selection Portfolio. Includes size, material, price and installation information. Write today to:

Byron Jackson Pumps
INC.
A Subsidiary of Borg-Warner Corporation
P.O. Box 2017A, Terminal Annex
Los Angeles 54, California

BJ

There's an Advantage to being HORIZONTAL



There are lots of advantages in using a Maloney-Crawford horizontal separator:

1. **It's easier to install**
2. **It's easier to service**
3. **It will usually handle more oil and gas than the same size vertical separator**
4. **It will handle foamy oil**

Maloney-Crawford uses Fisher valves and controls, famous for reliability. M-C separators are available in all pressure ranges and sizes. They are easily made into any required size of packaged stage separation.

See a Maloney-Crawford representative before you buy a separator.

MALONEY-CRAWFORD TANK & MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria — Box 659 — Tulsa, Oklahoma
EXPORT REPRESENTATIVE: Baird Lines, 1037 Grand Central Terminal Building, New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd., Edmonton, Alberta
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company, Pampa, Texas

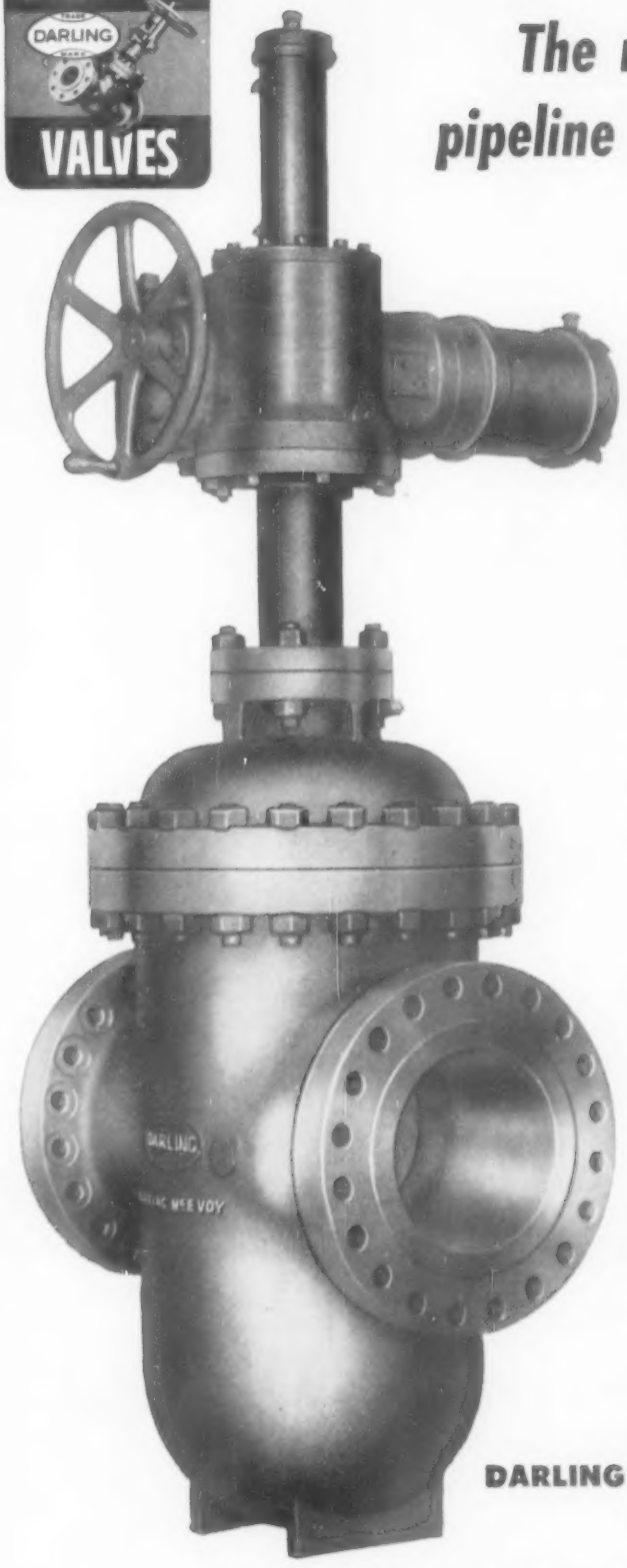
MALONEY-CRAWFORD TANK & MFG. CO.

DARLING VALVES

The most important pipeline valve development in years

TRADE DARLING MARK McEvoy

New self-sealing two-way conduit valve for pipeline service automatically injects sealant by means of existing line pressure



Here's a new type of conduit gate valve, available in 8-inch and larger sizes, that gives positive downstream closure without dependence on metal-to-metal contact. Each time the valve closes, the required amount of sealant is applied automatically.

How it works

Employing the time-tested McEvoy principle, two cylinders, filled with special sealant, are located within the valve. Both are operated by line pressure. Depending on the direction of flow, line pressure actuates one or the other of these cylinders to force sealant into a channel in the downstream face of the seat. Since these cylinders hold enough sealant for 50 or more closures, the valves need only periodic servicing for recharging with sealant.

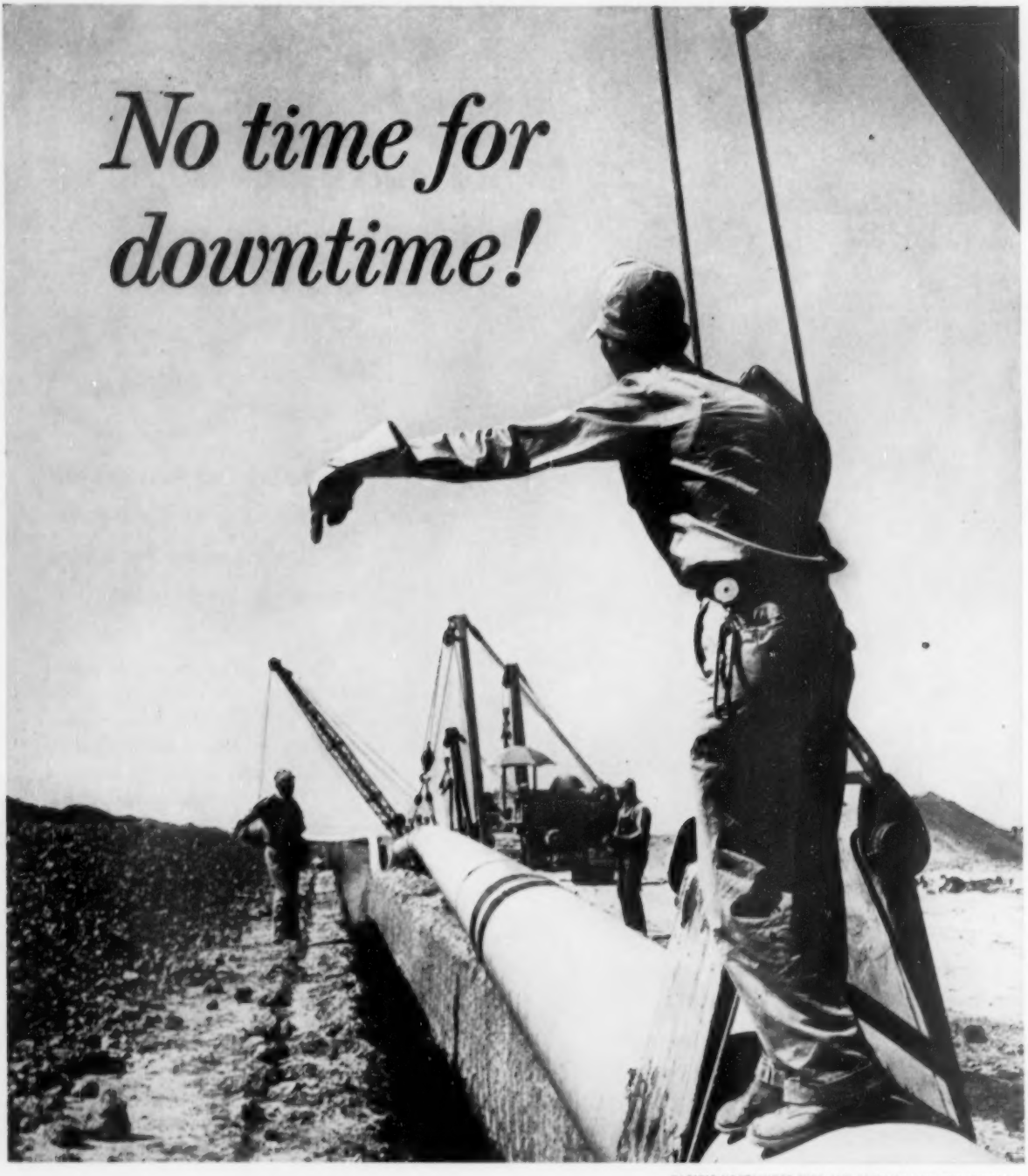
Write for details

Ask for bulletin #5402 which contains complete information on the design and operation of this valve.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

No time for downtime!



PACIFIC NORTHWEST PIPELINE CORPORATION PHOTOGRAPH

Staying on schedule is absolutely essential on a pipe line job.

That's why so many pipe line builders depend on Kaiser Steel for quality pipe to meet API specifications—*delivered as scheduled.*

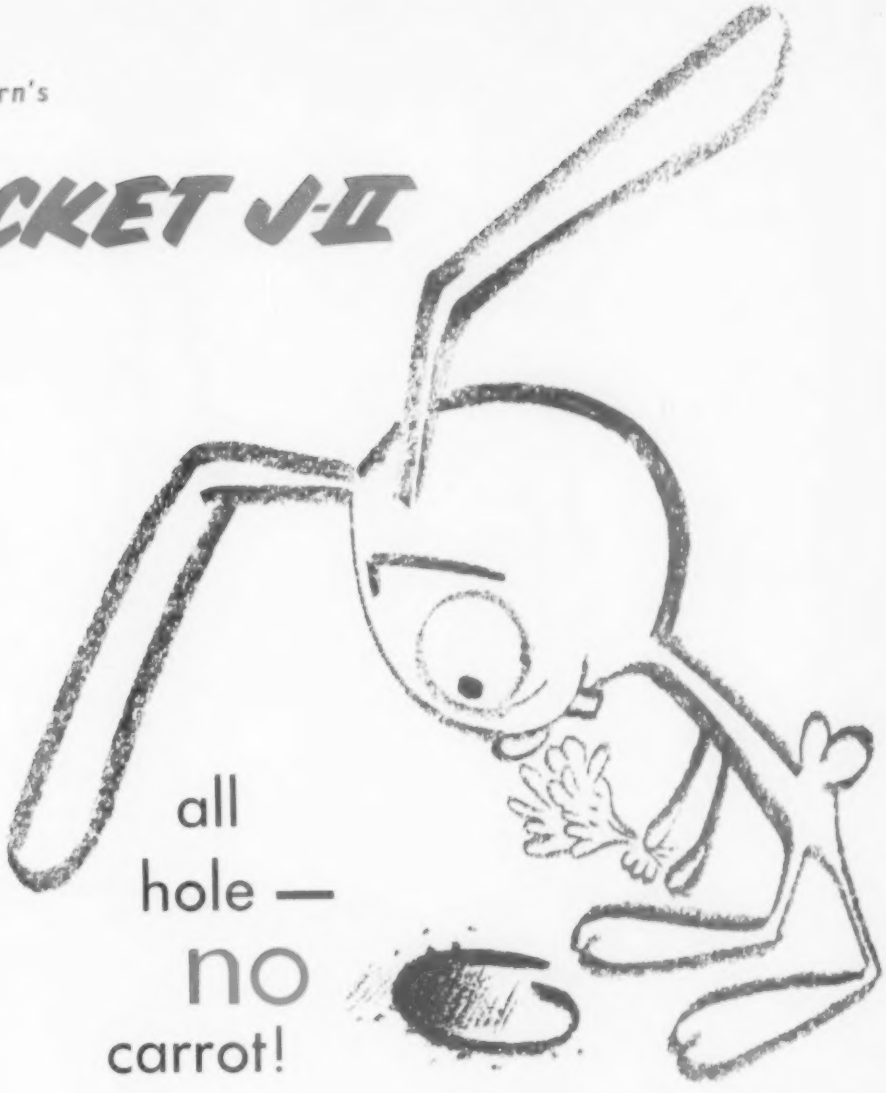
Next time you are ordering line pipe, specify Kaiser Steel Line Pipe. Rely on Kaiser Steel quality and service to add dollars to your operating profits.

Kaiser Steel

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

Western's

ROCKET J-II



all hole — no carrot!

The newest concept in perforating — that's Western's Rocket J-II.

Western has eliminated the carrot that blocks perforations in conventional jet perforating — the slug that robs the hole of effectiveness in fluid flow.

Developed by Western after more than a year of research, the Rocket J-II outperforms all other perforating tools. The Rocket J-II gives *effective* penetration — obstruction free — plus a larger entry hole.

Verified in tests supervised by the Perforation Investigation Committee — the recognized testing group for perforating — and proven in the field, the Rocket J-II averages a 5/8-inch diameter entry hole and 3.7 inches penetration in mild steel bars, the standard test target.

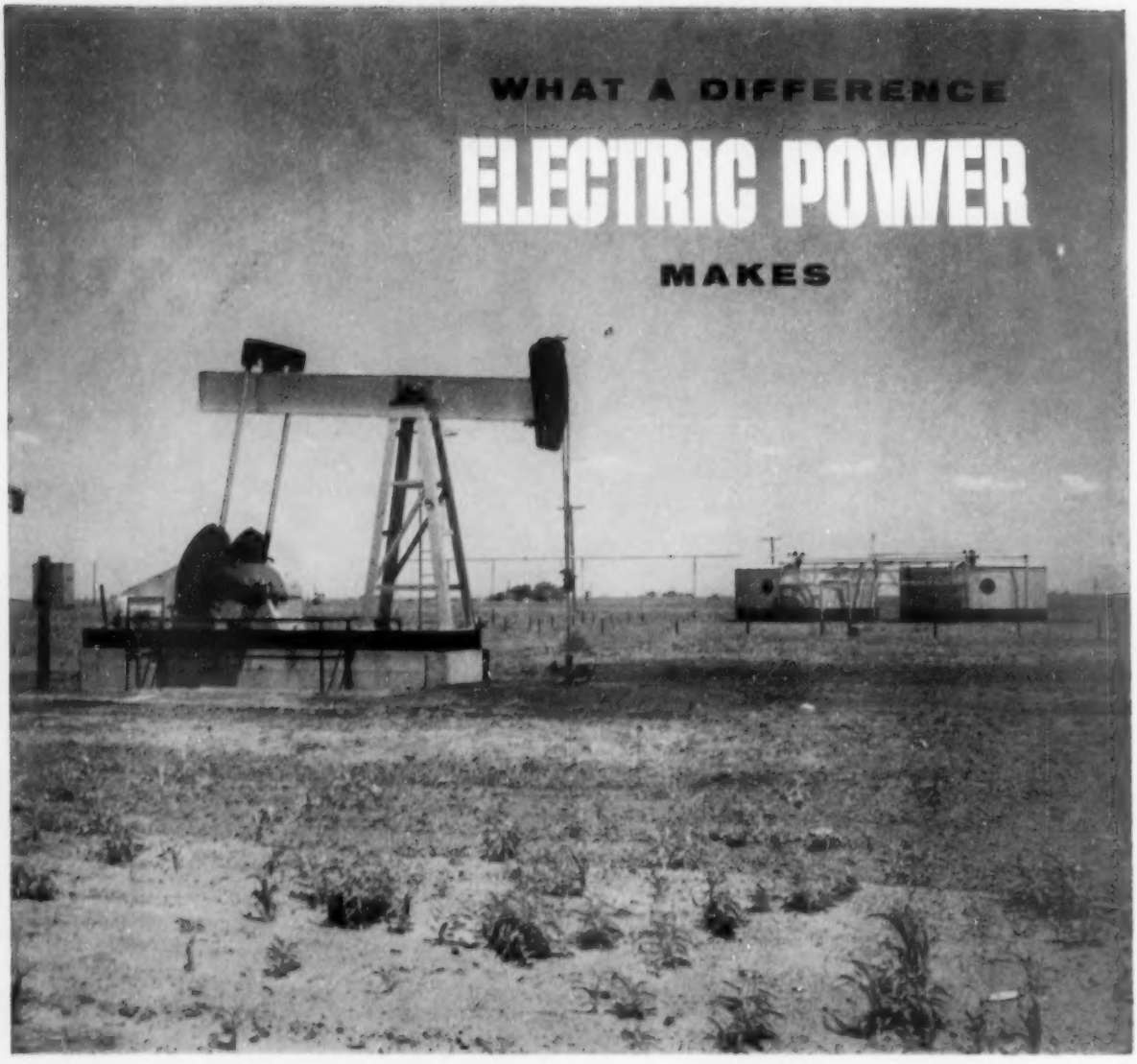
Perforate your well with the leader in perforating — the Rocket J-II — superior perforating at standard jet prices. Call the nearest Western engineer today. And for the other Western engineered well services — logging, fracturing and acidizing, next time, GO WESTERN!

WESTERN Engineered

THE WESTERN COMPANY

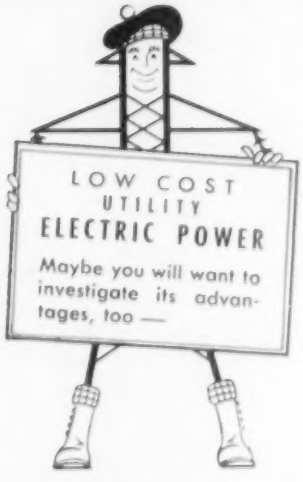
general offices: Midland, Texas

Texas: Odessa, Seagraves, Levelland, Snyder, Lubbock, Borger, Rankin | Okla: Lindsay, Healdton, Okla City | New Mexico: Hobbs | Kansas: Ulysses, Liberal

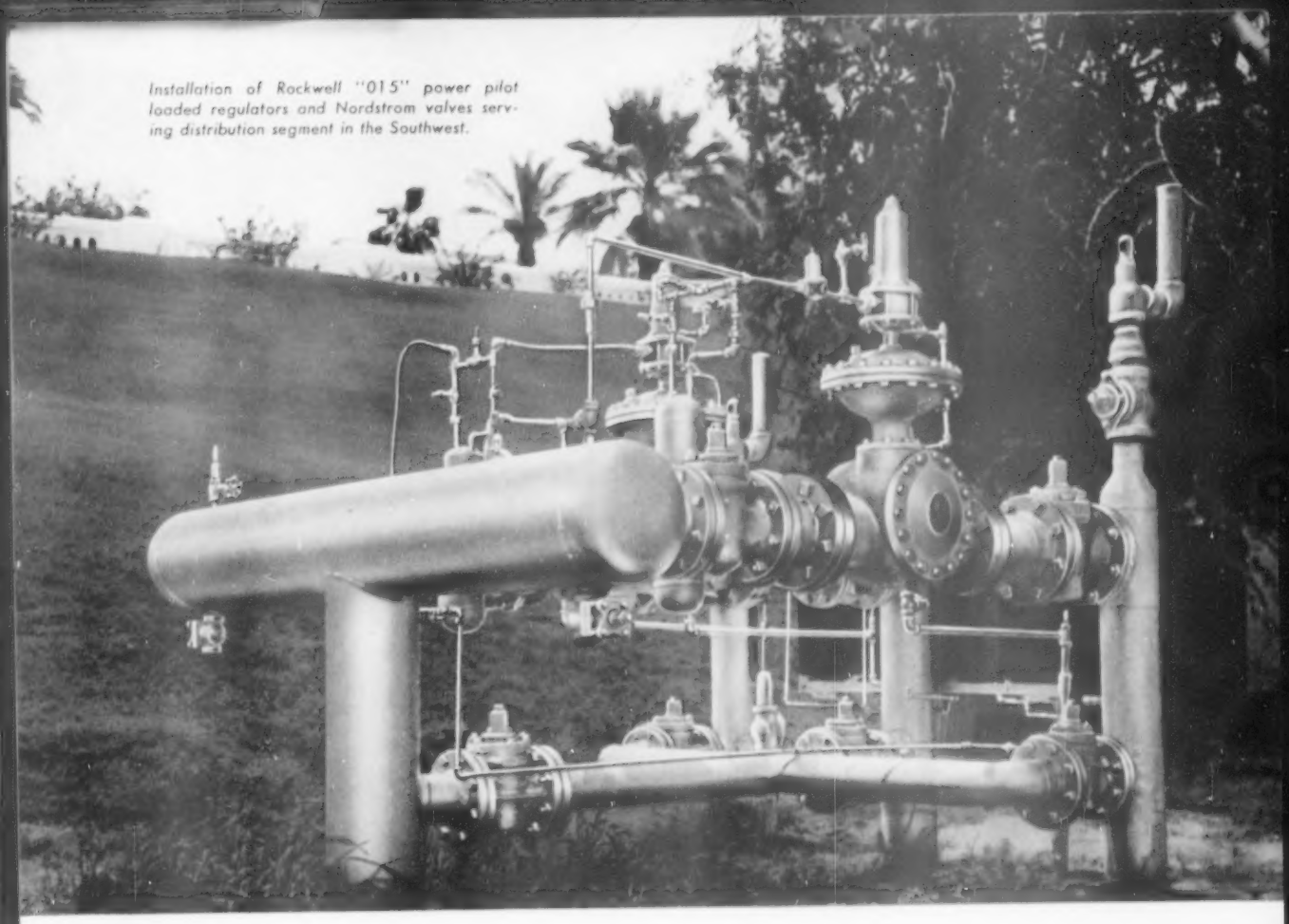


It's EFFICIENT and ECONOMICAL

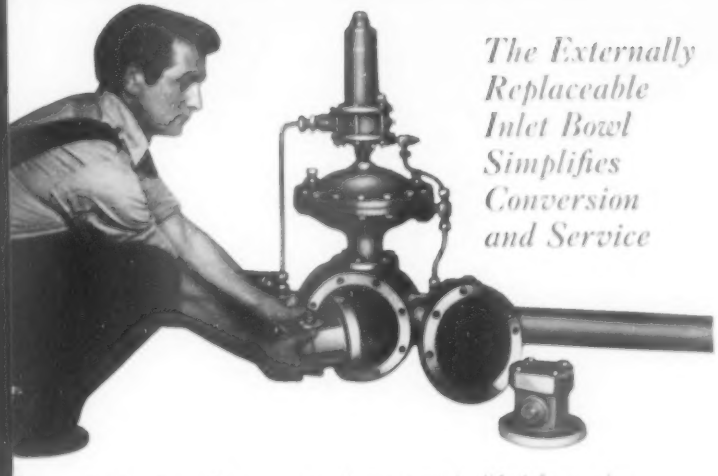
Regardless of the pumping situation... The swing is to Electric Power for the job. In the past 2½ years there has been a steady increase of over 11% in Electrified pumping wells. The reason? Because your Utility Electric Power Companies have done more to advance engineering practices which pave the way for this progress and to provide more dependable and efficient power service when and where it is needed. Next time you specify Power... specify Low Cost Purchased Electric Power.



WRITE PETROLEUM ELECTRIC POWER ASSOCIATION, P. O. BOX 2771, DALLAS, TEXAS, OR CALL THE SALES ENGINEER OF YOUR LOCAL UTILITY ELECTRIC POWER COMPANY — NOW



Installation of Rockwell "015" power pilot loaded regulators and Nordstrom valves serving distribution segment in the Southwest.



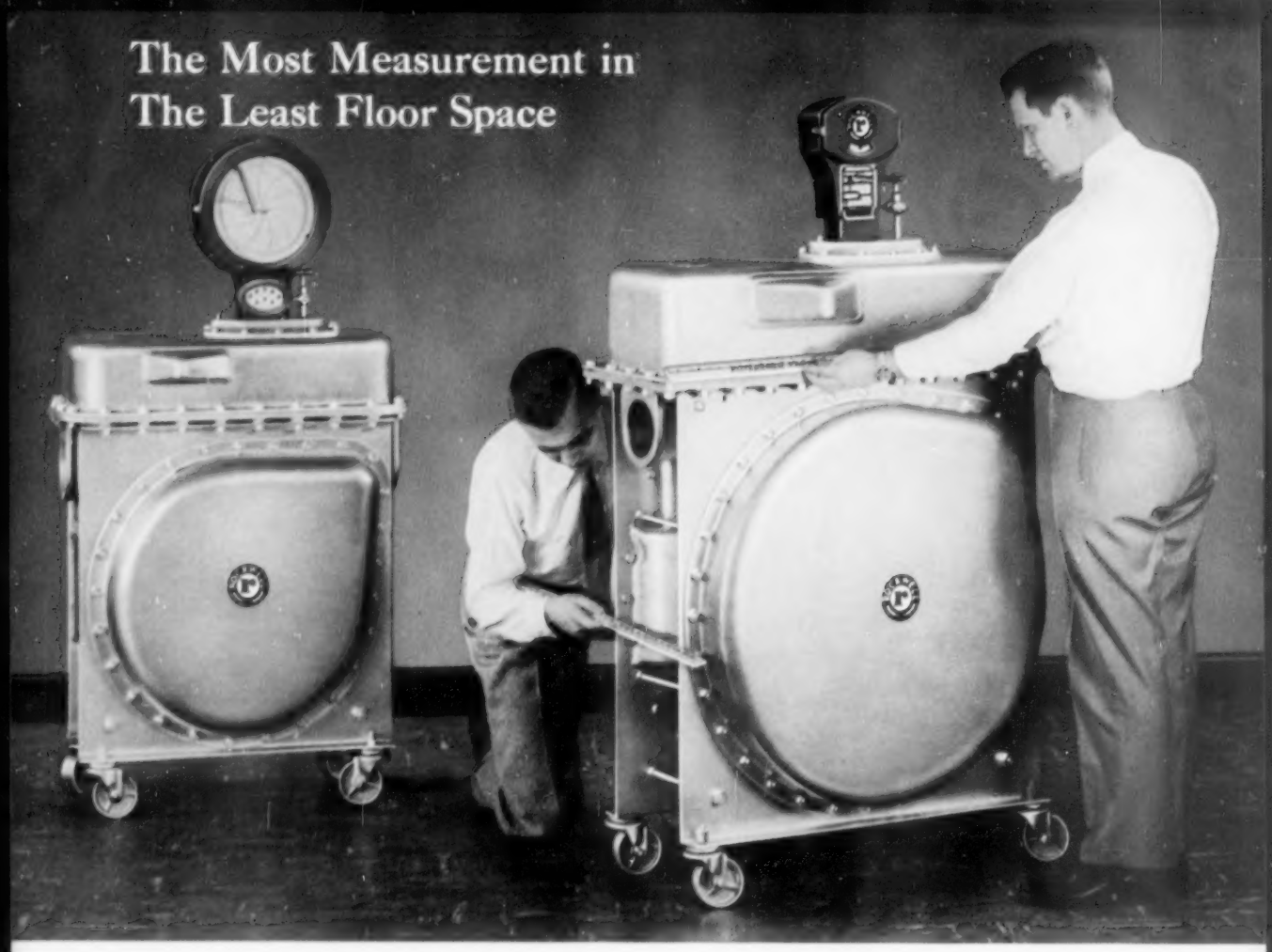
The Externally Replaceable Inlet Bowl Simplifies Conversion and Service

Rockwell regulators rarely, if ever, need be lifted for service. All parts subject to wear or abrasion can be quickly replaced *with the regulator in the line*. The valve chamber (inlet bowl assembly) is easily removed through a hand hole area in the side of the body. A new or rebuilt chamber having either hard or soft seats readily bolts in its place. By substituting a different size valve chamber *on the same bolt circle*, the capacity of the regulator can be changed at will.

Everything's Under Control... *for now and later*

A whole new future unfolds when you first install Rockwell balanced valve regulators. For example, at a later date you may wish to change the control system, say, from lever and weight to pilot loading or even instrument control. You can apply any of the Rockwell automatic controls to the same basic regulator body without breaking the line connections. And the exclusive interchangeable valve chamber construction (see left) provides the utmost convenience in sizing the capacity of existing regulators up or down. Many utilities use this Rockwell feature to meet seasonal demands. *Write for bulletin.*

ROCKWELL *Balanced Valve* REGULATORS



Another Measure of Rockwell Quality and Convenience

Like a skyscraper these Rockwell No. 4½ and 5 meters conserve space by going *up* instead of *out*. Their narrow width is particularly advantageous when manifolding several meters to measure extra large loads.

They are built around a sturdy valve plate casting that precisely locates and supports all working parts. Heavy gauge, pressed metal construction gives assurance of safety. The accuracy and durability of this Rockwell design has been proved by many years of service. Maintenance economy is a matter of record. Made in two sizes rated at 7,000 and 10,000 cfh with 4 oz inlet and 2 in. pressure absorption of 0.60 sp gr gas. These capacities can be increased materially by measuring gas at higher pressures. Correction to base volume is then accomplished with either a Rockwell Emcorrector or Combined Record Gauge. *Write for bulletin.*

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. Atlanta Boston Charlotte Chicago Dallas Denver Houston Kansas City, Mo. Los Angeles Midland, Texas New York Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

Meters and Regulators For Your Every Purpose and Need

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Tin

Aluminum

Cast Iron

Pressed Steel

REGULATORS

Industrial

Service

"1001"

Balanced Valve

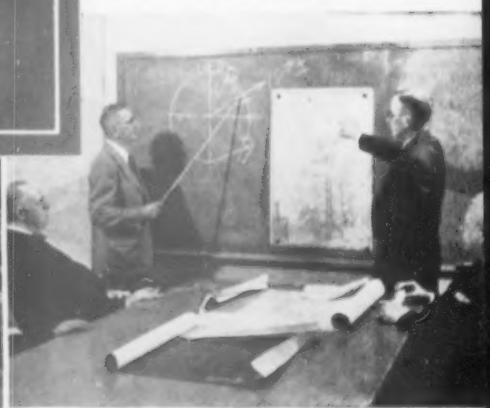
McKee engineers pool technical knowledge to assure correct plant design.

One of 15 specialized engineering groups in the McKee organization.

Every phase of design and construction is under expert direction and supervision.

Here's how McKee gives you

TOP-QUALITY ENGINEERING



McKee engineers call on many years of experience on plants all over the world to solve design problems.

The services of hundreds of well-qualified engineers are available to you at McKee.

● Because McKee is one of the top-ranking engineering and construction firms in the world, this organization continues, as it has for fifty years, to attract top men in the engineering profession.

That accounts for the superior quality of engineering delivered by McKee—the kind of engineering you'll want in your new plant.

You can place your project in the capable hands of this organization with the sure knowledge that every phase of engineering and construction will be executed by experienced, qualified experts—men who will design and build your plant to earn a profit.

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ENGINEERING & CONSTRUCTION
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Quick as a cat... Quiet as a mouse

CHAPMAN
Tilting Disc Check Valve

There, in a nutshell, is the story of a Chapman Tilting Disc Check Valve . . . quick as a cat, quiet as a mouse. It's designed that way. It's built that way . . . for fast, sure, quiet action. Or, in other words, it's yours for best performance at lowest long-range operating costs.

With a Chapman Tilting Disc Check Valve, there's no noise, no vibration, no fluttering. There's no banging or slamming with damage to system or valve. There's no scraping or wearing of disc and seat. Your head loss or flow resistance is kept at a minimum.

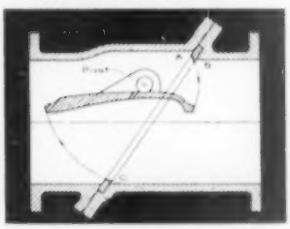
To put it briefly, with a Chapman Tilting Disc Check Valve, there's little or no maintenance even under severe operating conditions.

For Chapman Tilting Disc Check Valves in iron and steel . . . valves for handling fluids or gases under a wide range of pressures . . . valves for replacement or new piping systems . . . just check our Catalog 30-A. It's yours for the asking. Send for it now.

The CHAPMAN Valve Mfg. Company
INDIAN ORCHARD, MASSACHUSETTS

Never a Flutter, Never a Slam!

Designed and Built for Quiet Efficient Operation



In open position, specially designed "airfoil" disc balances perfectly. No vibration. No flutter. When flow subsides, disc drops quickly and quietly to a tight closed position. No jarring. No slamming. No damage to system or valve. Note enlarged area around disc to insure low flow resistance.

When you have a

FISHING JOB...

call your nearest

WILSON SUPPLY STORE

or telephone *Houston CA 2-6329

***Houston CA 5-3023 (night)**

The Right Men...The Right Tools Will Save You Money!

*FISHING TOOL DIVISION

"WHAT YOU WANT — WHEN YOU WANT IT"

MAIN OFFICE and WAREHOUSE—1301 CONTI ST.

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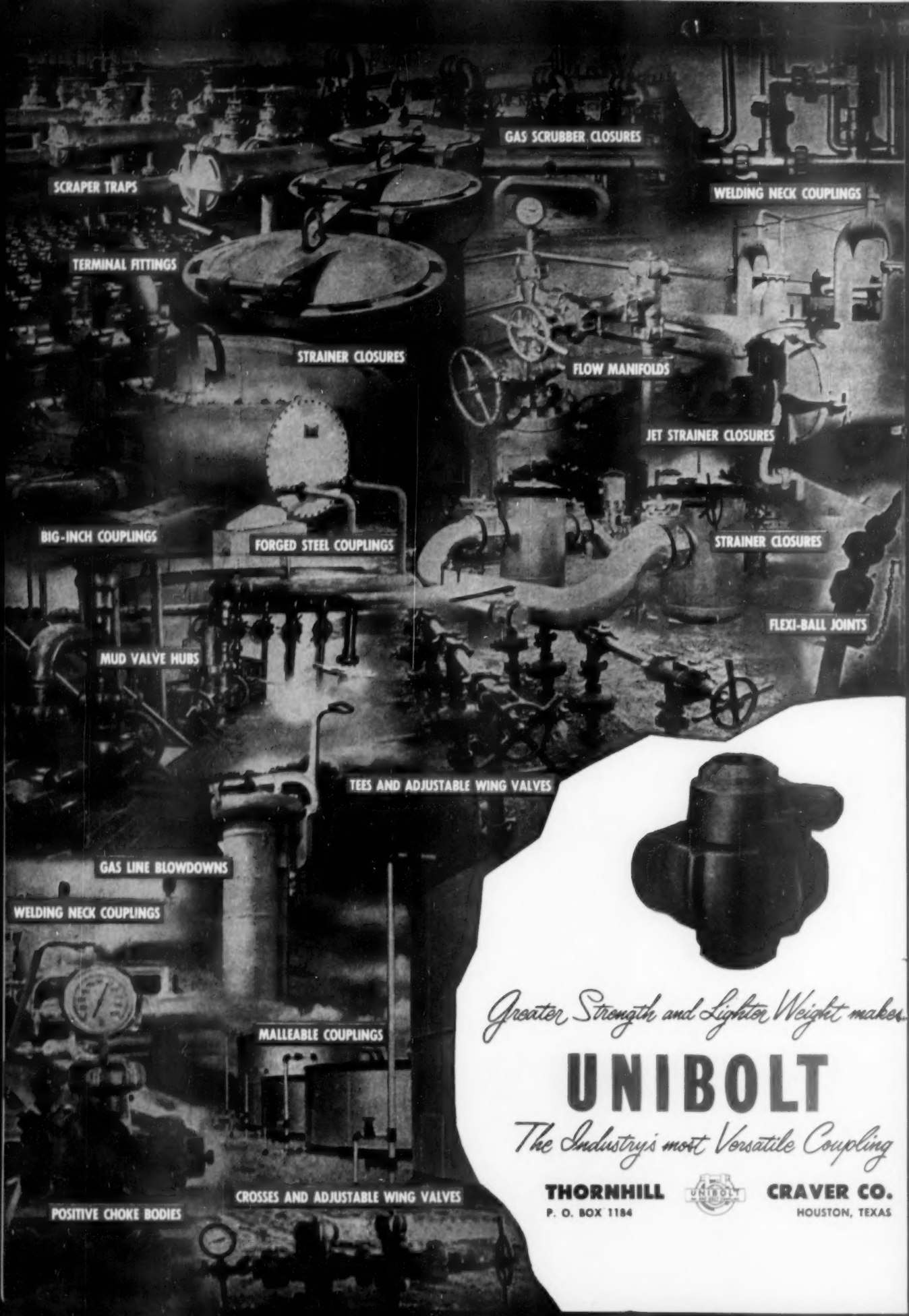


Greater Strength and Lighter Weight makes

UNIBOLT

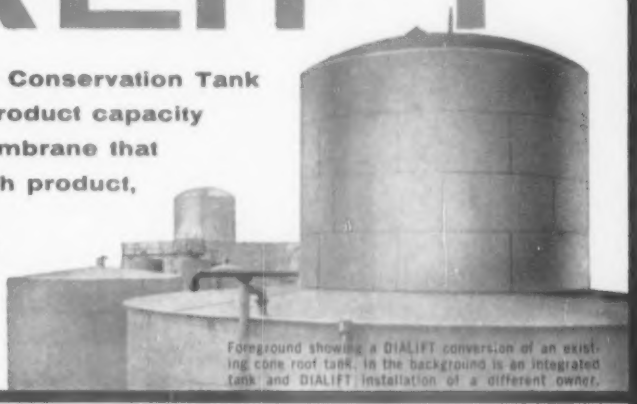
The Industry's most Versatile Coupling

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

The HAMMOND
DIALIFT

The ONLY membrane type Conservation Tank with full-rated vapor and product capacity AT ALL TIMES, with a membrane that cannot come in contact with product, vapor space that can be isolated for inspection and maintenance without taking product storage tank out of service.



Foreground showing a DIALIFT conversion of an existing cone roof tank. In the background is an integrated tank and DIALIFT installation of a different owner.

Principle of the Hammond Dialift

- A— DIALIFT DIAPHRAGM rises and falls to accommodate expanding and contracting vapor.
- B— Vapor passes to and from tank and DIALIFT through simple elbow connection.
- C— DIALIFT and tank have full-rated capacity.
- D— Membrane can't come in contact with product.
- E— DIALIFT can be isolated for maintenance and inspection, product tank stays in service.

The most efficient and economical vapor conservation system for new or old tanks.

THE HAMMOND DIALIFT consists of a gas-tight Vulcalock membrane attached to the inside periphery of a cylindrical metal housing to become a "breathing" apparatus to accommodate the expanding and contracting vapor as developed in product storage tanks. The DIALIFT can be used as a single conservation unit by being attached to the roof of a product storage tank or as a central "breathing" system by being manifolded to a number of product storage tanks. There are two forms of installation: —Ground type manifolded to a number of tanks to form a conservation system and integrated type whereby the DIALIFT is attached to the roof of a product tank for vapor conservation for one or a number of tanks.

The DIALIFT is completely isolated from the product storage tank. Vapor passes between the tank and DIALIFT through a vaporline connection. It is easy to convert old cone roof tanks to efficient vapor-saving DIALIFT installations by attaching a DIALIFT housing with membrane to the roof of the old tank and connecting the vaporline between the tank and DIALIFT.

New or converted DIALIFT tank, inter-connected with cone-roof tanks, becomes central "breathing" unit

DIALIFT GROUND UNIT serves as central "breathing" apparatus of multi-tank conservation system.

THE HAMMOND DIALIFT ELIMINATES BREATHING LOSS AND REDUCES FILLING LOSS

Write for catalog 55DL

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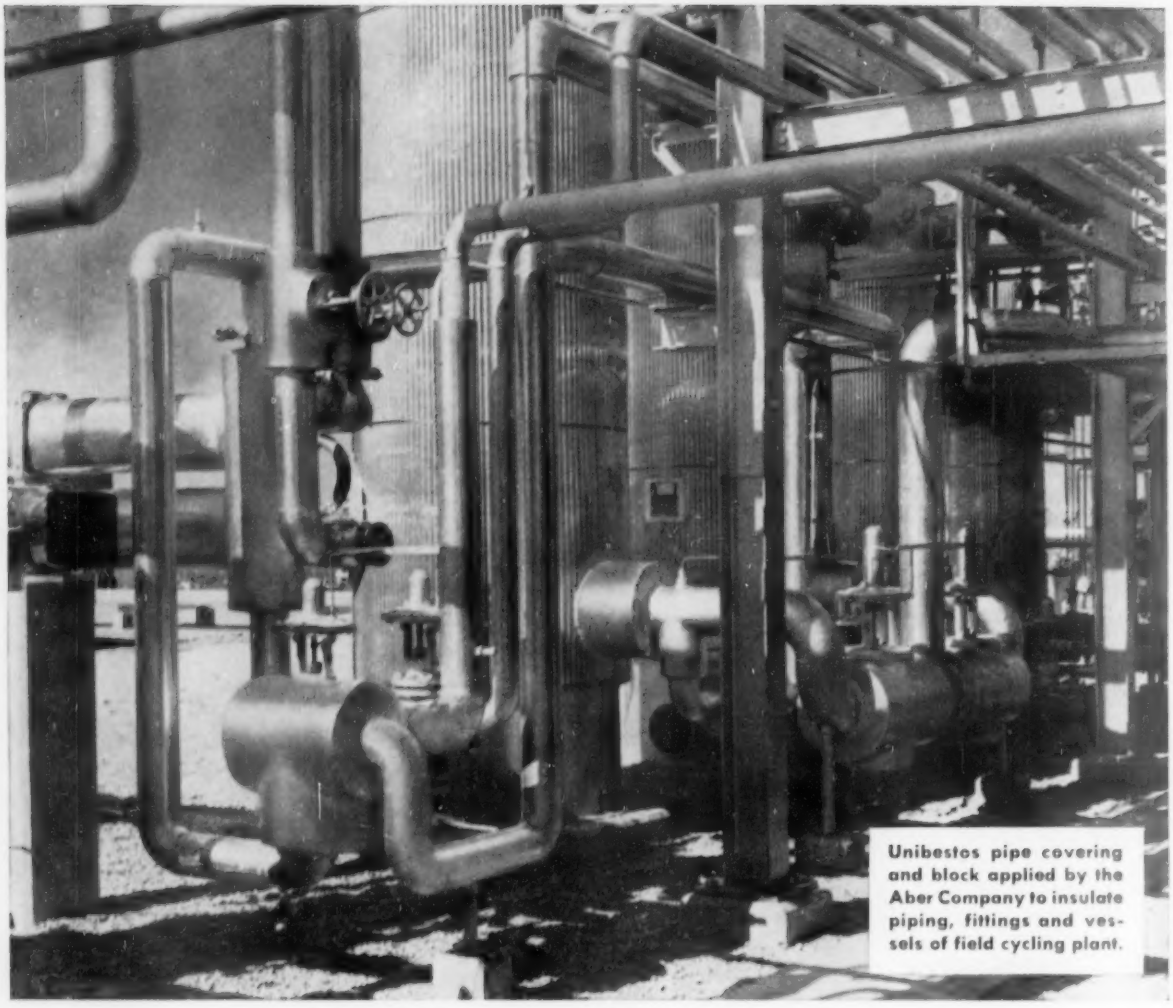


Unibestos pipe covering and block applied by the Aber Company to insulate piping, fittings and vessels of field cycling plant.

Unibestos makes hardest joints seem easy

Nothing is tougher to insulate than fittings. Yet whole networks of tees, ells, expansion joints and other fittings are required for today's refining process. Protecting these systems really tests the efficiency of any pipe insulation. And when it comes to cutting heat loss to a minimum, more and more refineries are relying on *single-layer* Unibestos®.

Unibestos gets its superior insulating properties from Amosite. This quality asbestos has long interlacing fibers that form positive heat seals at the joints—to provide protection without additional calkings.

And Unibestos has the strength to withstand shock...the stability to resist moisture, acid or chemical fumes. Easy to cut, miter or groove, single-layer Unibestos can be installed faster with virtually no cleanup. Unibestos pipe insulation is available in sectional form through 44" O.D.

Joe Bestos says:

Only single-layer Unibestos is so simple to install on fittings. It cuts and handles easily without breaking.

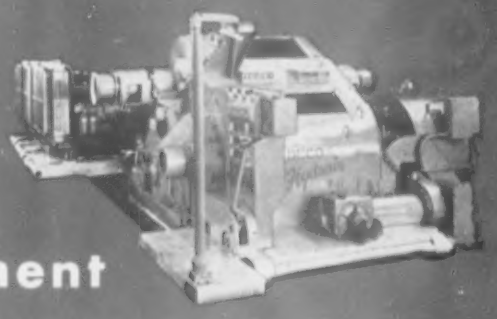
Write for **FREE** descriptive Bulletin 109C.

UNARCO

UNION ASBESTOS & RUBBER COMPANY

1111 West Perry Street • Bloomington, Illinois

J&L SERVICE
makes IDECO Rigs a blue chip investment



DEPTH RATINGS (FEET) WITH 4½" DRILL PIPE

20,000
16,000
15,000
14,000
12,000
10,500
8,000
7,000
6,000
5,000
4,500
3,300
2,500

RIGS for every job

Get your J&L store on the telephone for information about new IDECO rigs — 2500 Series in electric, torque converter, mechanical, with 2500 HP input.

1350-S AIR-FLO; 1600-2400 HP input; torque converter drive.

PR-1350 AIR-FLO POWER RIG; 1500 HP input; mechanical or fluid coupling drive.

PR-1050 POWER RIG; 1400 HP input; mechanical or fluid coupling drive.

SUPER 7-11; 1250 HP input; torque converter, fluid coupling, or mechanical drive.

H-7-11 HYDRAIR; 700-1050 HP input; torque converter drive.

M-750 mechanical drive; H-750 torque converter drive; 750 HP input.

H-525 HYDRAIR; 600 HP input; torque converter drive.

H-40 HYDRAIR; 400 HP input; torque converter drive; skid mounted, or trailer mounted as a Rambler rig.

H-35 HYDRAIR; 350 HP input; torque converter drive; skid mounted, or trailer mounted as a Rambler rig.

H-30 HYDRAIR; 300 HP input; torque converter drive; skid, truck, or trailer mounted. Servicing depths to 10,000'.

H-25 HYDRAIR; 230 HP input; torque converter drive; skid, truck, or trailer mounted. Servicing depths to 9,000'.

H-20 HYDRAIR; 200 HP input; torque converter drive; skid mounted, or trailer mounted as a Rambler rig. Servicing depths to 7,500'.

PARTS for every rig

An IDECO rig is more than a highly functional piece of rugged equipment.

It's a blue chip investment guaranteed practical by J&L parts service, finest in the United States and Canada.

When you move in with an IDECO, parts are ready. Regularly expendable parts are available at all J&L stores in active drilling areas. Major parts are stocked by J&L stores at these points:

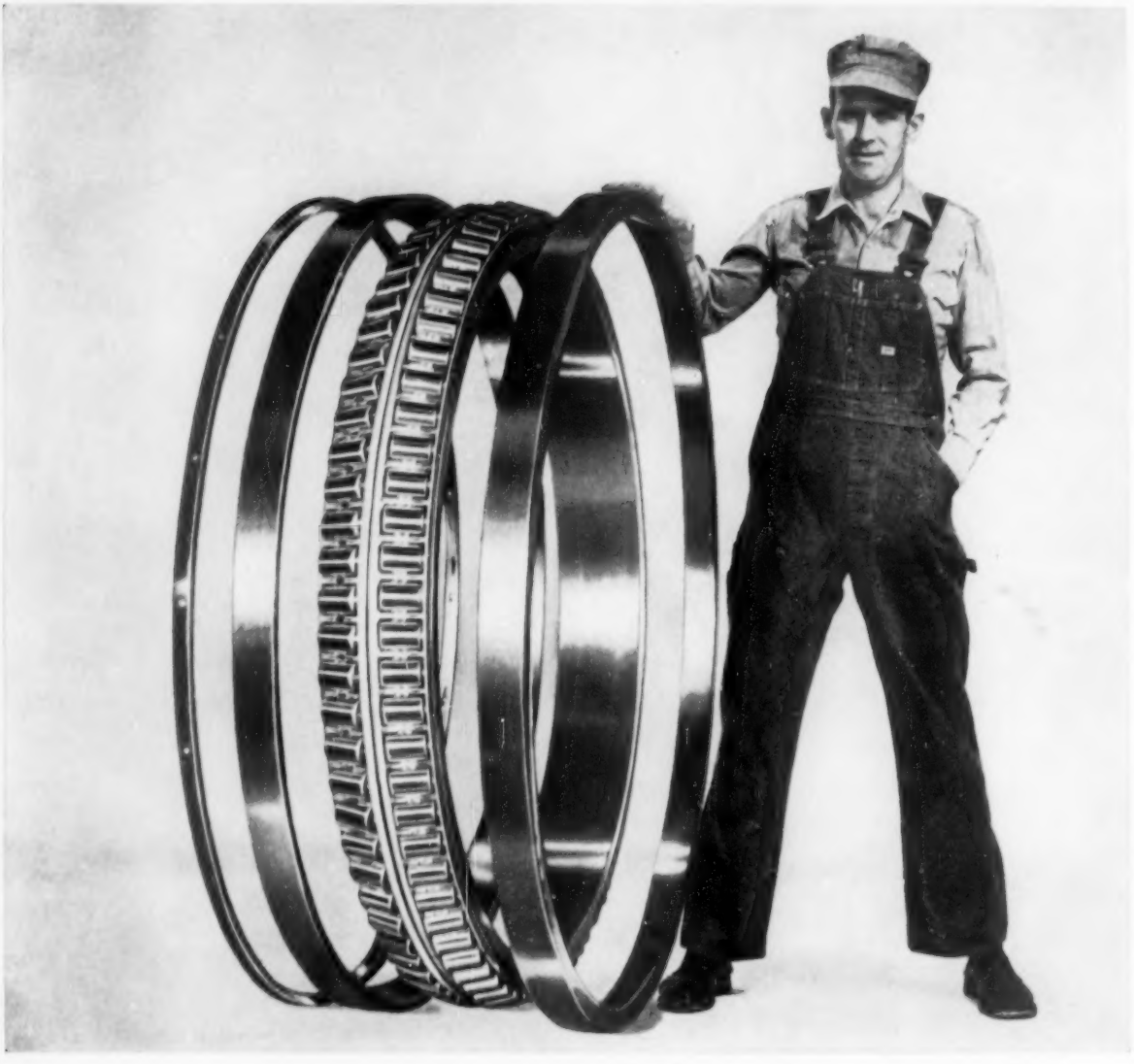
Casper, Wyoming
Great Bend, Kansas
Oklahoma City, Oklahoma
Shreveport, Louisiana
Corpus Christi, Texas
Odessa, Texas
Wichita Falls, Texas
Natchez, Mississippi
Houma, Louisiana
Hobbs, New Mexico
Edmonton, Canada

Jones & Laughlin
SUPPLY DIVISION – Tulsa
SERVING THE UNITED STATES AND CANADA

ALL IDECO RIGS have air controls and air clutches — fast, smooth, flexible. The torque converter on Hydrair hoists provides infinitely variable speed with high torque multiplication. Exactly the power you need is always there without throttling, clutching, declutching. Call any J&L Supply number for IDECO Catalog giving detailed descriptions, specifications, performance characteristics of the world's most wanted rigs.

13-M

TORRINGTON *CUSTOM-MADE* BEARINGS



"This 63" bearing was custom-made for us—by TORRINGTON!"

Building custom bearings for industry is a Torrington specialty. Whatever the anti-friction assignment—Torrington can design and build the bearing for the job.

When you specify a Torrington job-designed bearing, you're calling on engineers with extensive experience in custom-bearing applications. Torrington will survey your needs, recommend and design the right bearing to provide peak efficiency, economy and service life.

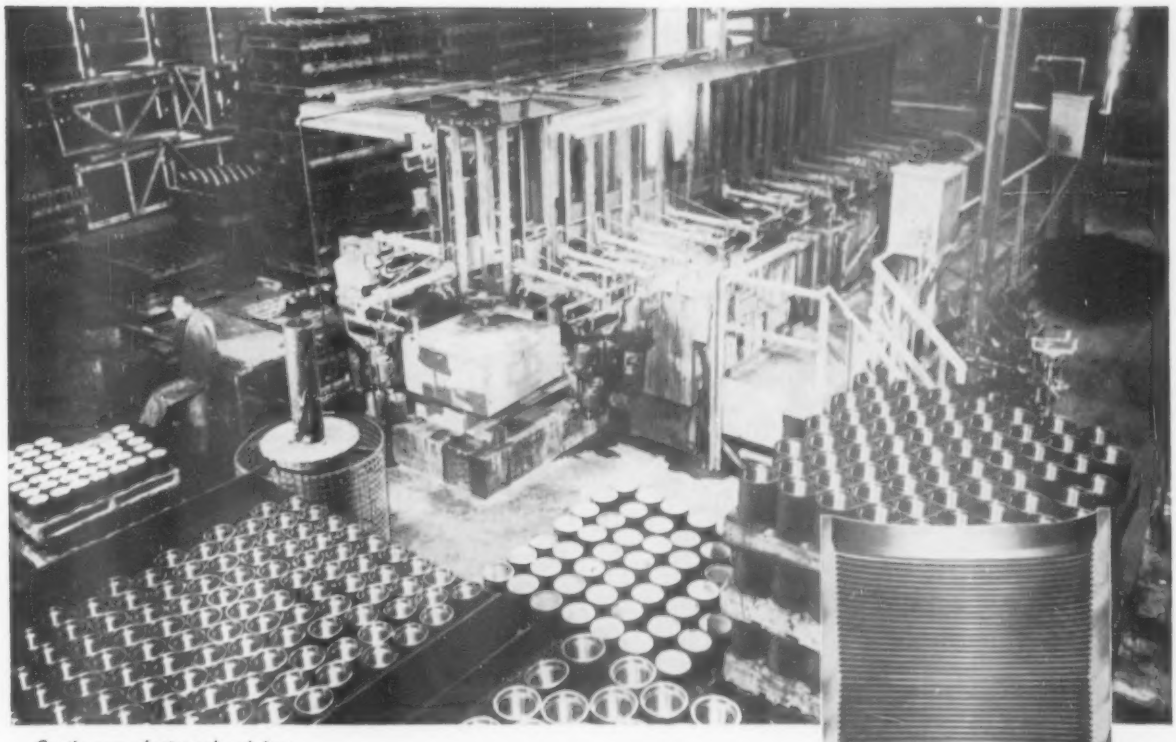
For *any* standard or custom bearing, backed by broad manufacturing and design experience—specify TORRINGTON.

THE TORRINGTON COMPANY
South Bend 21, Ind. • Torrington, Conn.
District offices and distributors in principal cities of United States and Canada

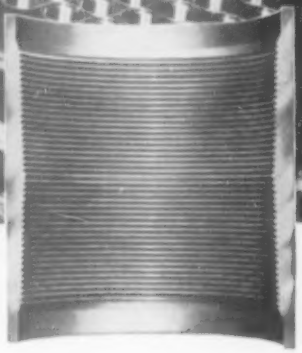
90th ANNIVERSARY

TORRINGTON BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller
Needle • Ball • Needle Rollers



Continuous electrogalvanizing unit for CF&I Seamless Couplings.



Cross section photograph of actual CF&I Seamless Coupling.

CF&I QUALITY COUPLINGS FOR SEAMLESS CASING AND TUBING

Rigid manufacturing standards, testing and re-testing are typical of the care CF&I exercises from mine through manufacture. These manufacturing standards assure Seamless Tubular Products of the highest quality.

The stresses imposed on oil country tubing and casing joints demand exacting manufacturing controls. One requirement in obtaining quality joints is to have a tight seal between the coupling and the pipe. This can be obtained only if the couplings and pipe are manufactured under the strictest specifications.

API Specifications require that all couplings must be processed to minimize galling. CF&I electrogalvanizes all couplings and exceeds this specification by carefully controlling the exact thickness of pure zinc—just enough zinc to prevent galling, but not enough to fill in the threads. This is just one example of the extra care which CF&I takes in the manufacturing process of their Seamless Tubular Products.

CF&I Seamless Oil Country Casing and Tubing meets API STD 5A Specifications—in sizes from 2⅜" O.D. through 9⅝" O.D.

3894

SEAMLESS TUBULAR PRODUCTS
THE COLORADO FUEL AND IRON CORPORATION
Denver, Colorado

CF&I

NEW Bucyrus-Erie 85-Ft. SERVICING DERRICK Simplifies Deep Workovers with 48-L

Here's an important addition to the long list of significant Bucyrus-Erie research developments in spudder design — an 85-ft. servicing derrick as special equipment for the 48-L spudder. Based on careful study of field needs, the new derrick provides added height without sacrifice of portability for fast, profitable clean-out, rod and tubing, or other servicing work. Its welded steel structure is similar to the 48-L's standard 60-ft. derrick which is unexcelled for strength and durability. Check the new derrick's outstanding features:

AMPLE HEIGHT
Plenty of lifting space to pull 30-ft. doubles.

BIG CAPACITY
Handles up to 60,000 pounds of tubing.

STRONG STRUCTURAL DESIGN
12-in. lower section channels, 11-in. upper section channels. Upper section is made of laced angle construction.

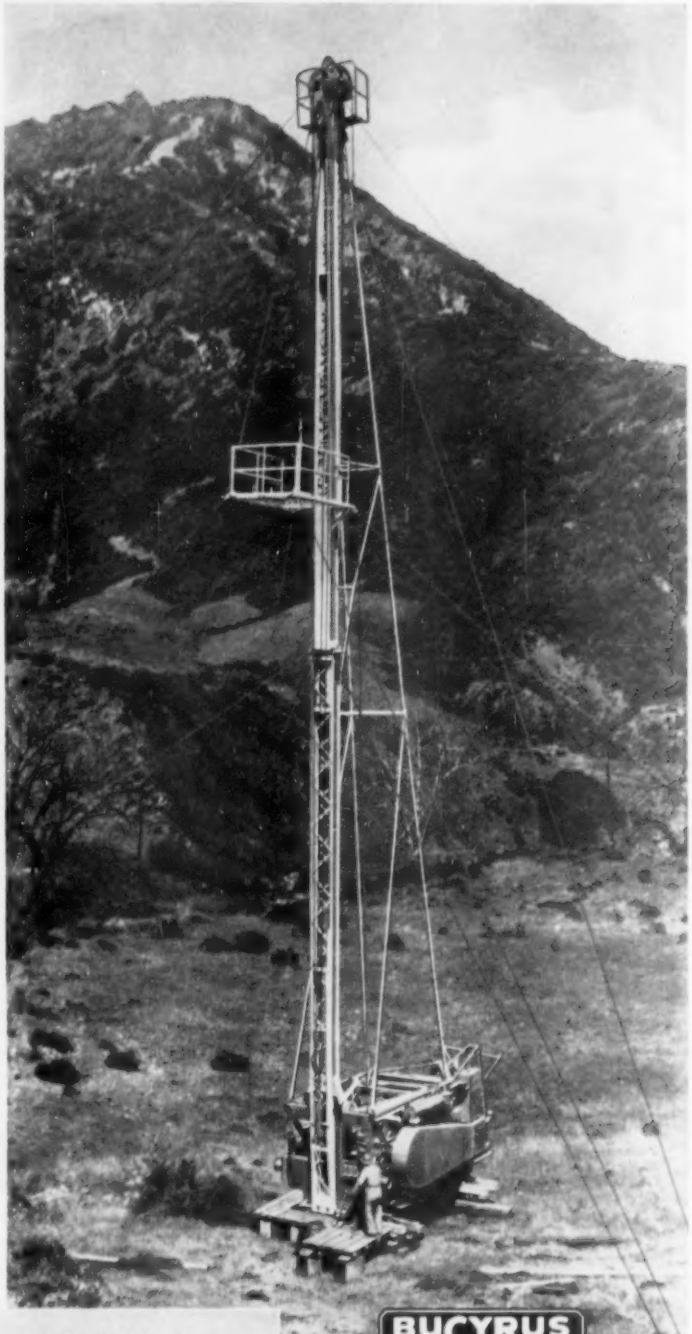
SIMPLE DESIGN
Telescoping 2-section derrick is power lowered, lays down over spudder for fast road travel.

CONVENIENT TUBING RACK
A fingerboard for racking well tubing is arranged to hold a total of 7,920 feet in 60-ft. stands.

EASY FIELD ERECTION
Power-raised with built-in oversize derrick hoist drum using 4-part hoisting line. When fully extended, guy lines can be set quickly — four each from the lower section, the fingerboard, and the top of derrick respectively.

This new-type derrick is available for 48-L s already in the field, or it may be ordered with a new machine in place of the standard derrick. Write today for complete details.

34556



FIRST with the FINEST in Spudders

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

☆

Unit started up immediately . . .

☆

Down only 5 days in 8 months . . .

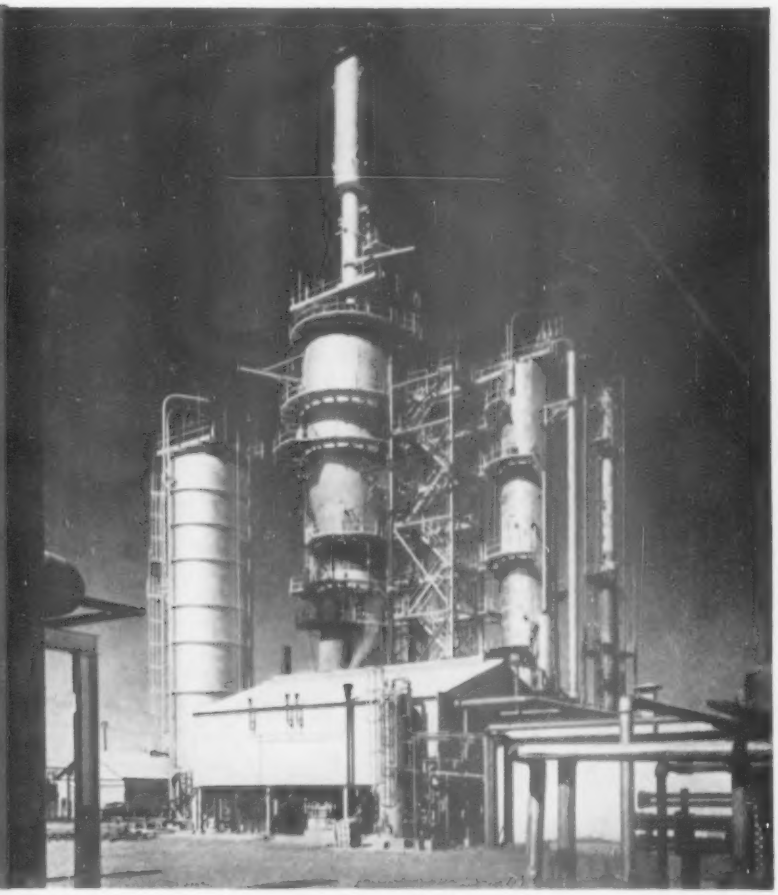
☆

Operating at 79% conversion . . .

☆

Output 10% above design rating . . .

☆



Champlin's Orthoflow* Proves Itself

FLUID CATALYTIC CRACKER

When Champlin Refining Company became part of The Chicago Corporation, up to $10 million was invested in a modernization program to expand capacity and raise octane level of its Enid, Oklahoma refinery. A major factor in minimizing initial cost of these facilities, and getting them on stream quickly and efficiently, was an Orthoflow Fluid Catalytic Cracker. Designed and built by The M. W. Kellogg Company for a fresh feed capacity of 9,000 BPD, and total throughput of 13,500 BPD, this Orthoflow also promises minimum maintenance.

The Orthoflow was erected by M. W. Kellogg well ahead of schedule, and went on stream without trouble immediately on completion. Within a month of initial operation, the unit fulfilled the Kellogg guarantees and was accepted. It operated continuously for 3 months, when repairs on the lube oil pump required a shutdown. This also permitted complete inspection of the interior of the Orthoflow, and reassured Champlin that the unit's lining and general condition were excellent. After 5 days, the unit was back in service, and ran without interruption for 5 months. Total time in service at this writing: 8 months. Total time out: only 5 days! The Orthoflow is now operating at 79% conversion rate, and about 10% above original design capacity.

The Champlin unit is one of seventeen Orthoflow Fluid Cat Crackers engineered or erected by The M. W. Kellogg Company for leading refiners throughout the world, with throughput capacities ranging from 3,500 BPD to 102,000 BPD. The trend toward this vertical-design cat cracker is graphically explained in a full-color, 15-minute animated movie. Refiners interested in seeing this film in their offices can make arrangements by contacting M. W. Kellogg.

*Trademark of The M. W. Kellogg Company

Refinery Process Division

THE M. W. KELLOGG COMPANY

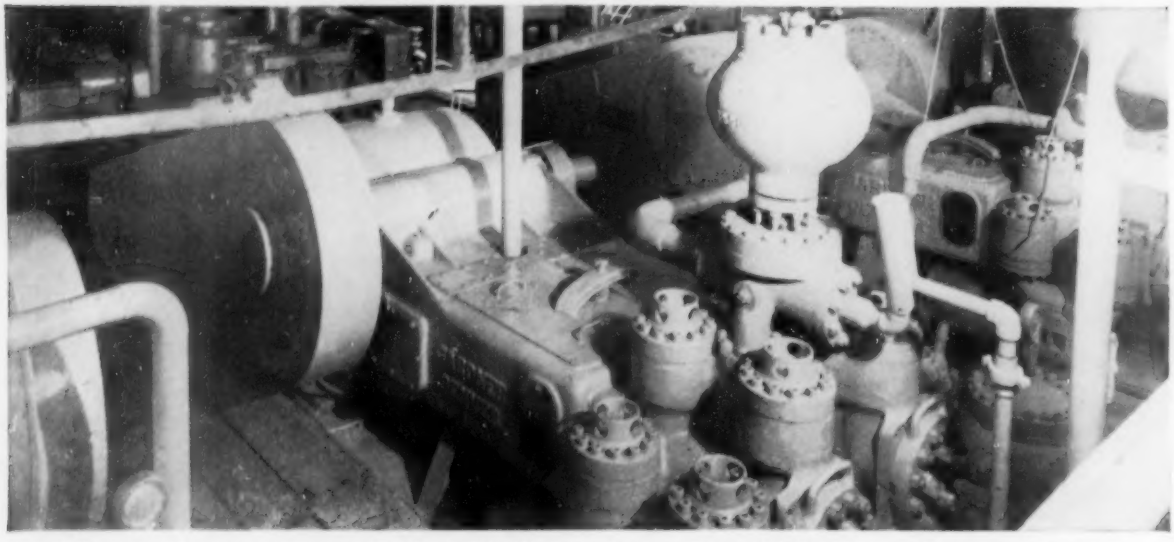
711 Third Avenue, New York 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York
Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

M KELLOGG W

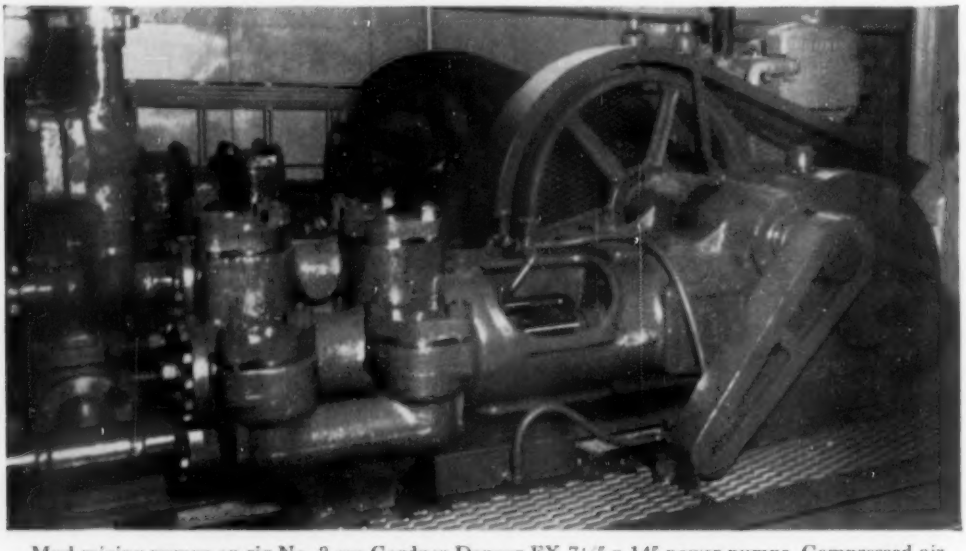
Gardner-Denver... Serving the World's Basic Industries



Primary mud pumps on Rimrock Tidelands Rig No. 3 are Gardner-Denver Model GX 7" x 16" power mud pumps.

another new offshore rig equipped with

GARDNER-DENVER PUMPS



Mud mixing pumps on rig No. 3 are Gardner-Denver FX 7¼" x 14" power pumps. Compressed air for serving the rig is furnished by Gardner-Denver Model AD 5½" and 3" x 4" air compressors.

GARDNER-DENVER

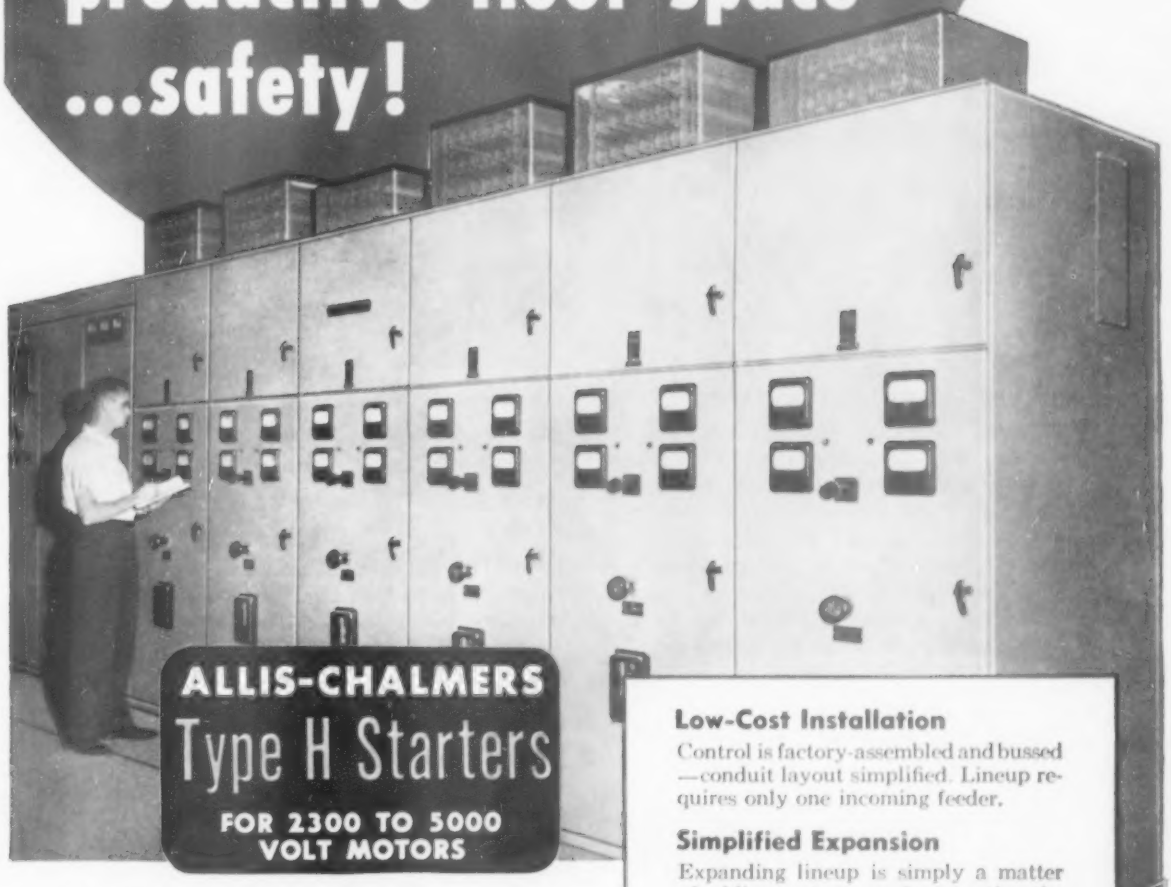
THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada) Ltd., Winnipeg — Edmonton — Toronto
Gardner-Denver Export Division: 233 Broadway, New York 7, N. Y.

— Oil Field Offices —
Dallas, Houston, Tulsa, St. Louis, Los Angeles, New York, Pittsburgh, Denver, New Orleans, San Francisco, Kansas City

You get **MORE** when it's Built by Allis-Chalmers

...more convenience... productive floor space ...safety!



Centralized Control for an entire plant or department

Time-saving, cost-cutting convenience in planning, buying, installation, and operation are all yours with Allis-Chalmers centralized high voltage control. In addition, the factory-assembled lineup, installed in an out-of-the-way location, releases critical floor space for profitable production. From the safety standpoint, the control operates in cleaner atmosphere and can be isolated from unauthorized personnel when located in a separate control room or area.

Low-Cost Installation

Control is factory-assembled and bussed —conduit layout simplified. Lineup requires only one incoming feeder.

Simplified Expansion

Expanding lineup is simply a matter of adding a starter and connecting the bus. Each starter unit is self-contained.

Attractive Appearance

Uniformity of cubicles presents modern, streamlined appearance. Concentrating control in one lineup eliminates cluttered look.

One Company Responsibility

Responsibility for assembling proper devices and for control performance rests with Allis-Chalmers.

For complete information, see your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

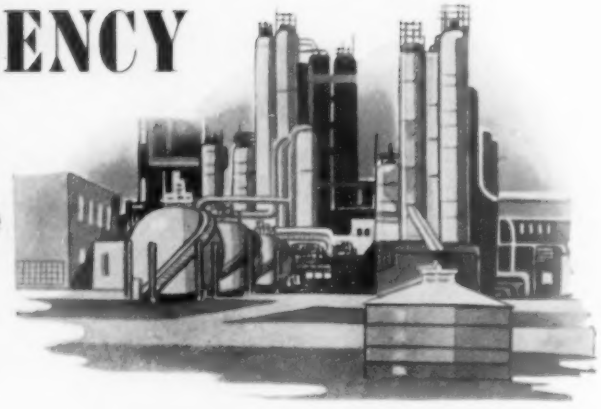
ALLIS-CHALMERS

A-4978

Another Opportunity to Save with Wolverine Trufin®—
Number 8 of a series.

STEP UP EFFICIENCY

Knock down Costs of Propane-Butane Condensers



You can boost efficiency—shave costs as well—when you specify Wolverine Trufin Type S/T for new installations or for retubing propane-butane condensers.

On new jobs Trufin can slash total tube requirements and provide greater heat transfer. That's because integral-finned Trufin provides approximately two times more outside surface area (per lineal foot of tube) for condensing than does plain tube. Trufin cuts unit costs even more because less tubing means smaller shells, headers, baffles and less maintenance.

When retubing, Trufin can skyrocket the BTU output of old condensers. Trufin is mechanically interchangeable with prime surface tube and standard fabrication and installation methods can be used. The tube wall at the plain end is heavier than the standard wall at the finned section providing added rigidity and maximum protection at the header.

Here is graphic proof of how Trufin increases throughput.

	"A" PLAIN TUBE HEAT EXCHANGER	"B" TRUFIN TYPE S/T HEAT EXCHANGER
SHELL SIZE O.D.	34 inch	34 inch
TUBE SPECIFICATION	⅝" O.D. 16 BWG Admiralty Plain Condenser Tubing	⅝" O.D. 16 BWG Admiralty Trufin Type S/T
TOTAL OUTSIDE AREA OF CONDENSER TUBING	3,460 Sq. Ft.	7,540 Sq. Ft.
TOTAL TUBE LENGTH	12,600 ft.	12,600 ft.
THROUGHPUT	81,050 lb/hr at 2000g/min water	127,000 lb/hr at 2000g/min water

Trufin is available in a wide range of alloys and sizes to meet your specific processing needs. For additional information and case histories of actual Trufin installations write for a copy of Wolverine's Design Manual "Opportunity."

Wolverine Trufin available in Canada through the Unifin Tube Company, London, Ontario.

DIVISIONS OF CALUMET & HECLA, INC.
CALUMET DIVISION
WOLVERINE TUBE DIVISION
CANADA VULCANIZER & EQUIPMENT CO., LTD.
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER CO.

WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPT. 13 E. 40TH ST., NEW YORK 16, N. Y.

TRUFIN®

SAVES YOU MONEY

8 WAYS

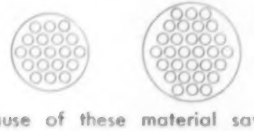
Anytime you cut down costs, you pep up the profit picture. Here's an idea: where heat exchange costs are concerned, Wolverine Trufin Type S/T—the integral finned condenser tube—can help you save money *eight* ways. Take a look at the points listed below. They can open the door to substantial savings, provide added dividends in increased efficiency.

✓ Because Trufin is an extended surface tube—with fins extruded right from the tube wall—it has more than twice the heat transfer surface of plain tube. Less tube is required because Trufin transfers more BTU's per foot of tube.

✓ Fewer tubes mean smaller shells, headers, baffles, etc. This saves material requirements.

✓ Fewer tubes mean fewer holes to drill—less rolling-in operations. Direct result: substantial savings in labor costs.

✓ To transfer a given heat load—when Trufin is used—much less weight of over-all tube metal is required. This is a real saving when expensive alloys are necessary. This is of greatest importance when alloys are in short supply, as a given quantity of metal in Trufin transfers much greater heat loads.



FEWER TUBES
MEANS SMALLER SHELLS

✓ Because of these material savings, lighter units—requiring less structural support—can be designed. This is vital when exchangers are to be mounted on superstructures.

✓ Maintenance costs are low. Costs of replacement tubes are reduced; fewer tubes result in less cleaning time, more "on stream" time. Actual operating data proves that Trufin withstands fouling for longer periods than does prime surface tube. This increases the length of operating time between change-overs.

EQUIVALENT TUBES
WITH THE SAME SURFACE

✓ Smaller, lighter units result in easier handling and lower shipping costs.

TRUFIN
MEANS
SMALLER
UNITS

✓ Where space is at a premium—as in revamped units—Trufin units are smaller.

There may are eight job-proven ways in which Wolverine Trufin Type S/T condenser tube can save you money. Wolverine's Trufin Opportunity Book is filled with actual Trufin case histories, operating data, valuable design information. Write for your copy today. WOLVERINE TUBE, 1449 Central Ave., Detroit 9, Mich.

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& EQUIPMENT CO., LTD.
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WOLVERINE TUBE

Division of Calumet & Hecla, Inc.

Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

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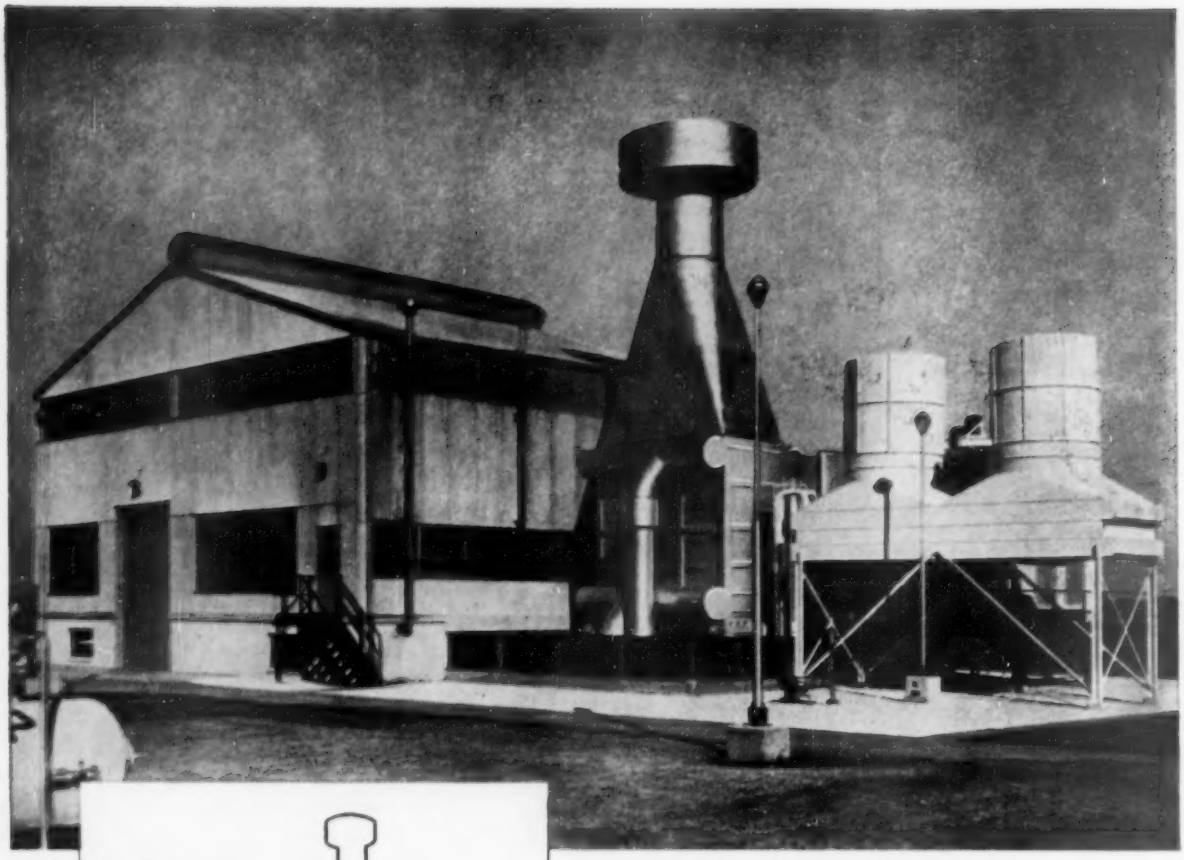
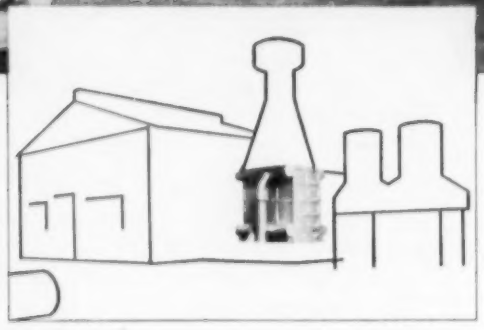




This is the Trunkline Gas Company's Edna Compressor Station with a Pin-Fin installed. Note the compactness of this regenerator.

* Specially designed "pin-like" shapes, which project inside the heat transfer core, give the new Air Preheater Pin-Fin its name. Their unique, patented design greatly extends heat-transfer surface area.

New Pin-Fin users are:

Tennessee Gas Transmission Co.	1 unit
Trunkline Gas Co.	3 units
Texas Eastern Transmission Corp.	6 units

NOW...economy in gas-turbine cycles with Air Preheater's new Pin-Fin* Regenerator

To compete commercially with Diesel engine steam-turbine and gas-engine cycles, a gas turbine must normally include a heat exchanger. And the most efficient unit for this service is Air Preheater's Pin-Fin—the new, extended-surface heat exchanger.

For example, a 75%-effectiveness Pin-Fin Regenerator in a gas-turbine cycle at 6-to-1 pressure ratio and a turbine inlet of 1500°F. will reduce fuel consumption by approximately 32%.

Air Preheater Pin-Fin Regenerators have been in service up to five years with no major maintenance problems. For details, call or write the Air Preheater Corporation.

MECHANICAL ADVANTAGES OF THE PIN-FIN

- Compact
- Lightweight
- Quickly erected
- Minimum maintenance
- Convenient, one-unit design
- Readily disassembled

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

National's rig-up service

pays dividends at the well site!

Would you like to arrive at your next well site knowing you're *fully* prepared for the job? A growing number of National Supply customers are doing so these days—because of our rig-up service on new equipment.

Here's how this outstanding service works. At a National plant, store or your own equipment yard, we assemble—or direct the assembly of—the complete rig. If you furnish the crew, they become familiar with the rig before it goes to the field. After assembly, the rig is test-operated for as long as 48 hours, lubricated and adjusted. Any needs that may cause an initial delay in the field are promptly filled. If you desire guide photographs and paint-coded parts for re-assembly, these are also supplied. Then the rig is dismantled and shipped to the well site.

During this test rig-up, all necessary parts and services are immediately available. While you pay the expenses, you don't have to pay "road time" for rig-up trucks and welders. You can better anticipate *all* your operating needs, and save much valuable time. Customers taking deliveries of such test-assembled rigs report *better rig-up jobs at lower cost than previous field assemblies!*

National's optional rig-up service is especially useful for the larger Ideal Rigs you'll see on the next two pages. It's not a new service—particularly for our export customers in all parts of the free world. But it is, like using dependable "National Blue" oilfield equipment, one of the best kinds of drilling insurance you can buy. The National representative or store personnel in your area will be glad to tell you more about it.

THE
NATIONAL SUPPLY
COMPANY

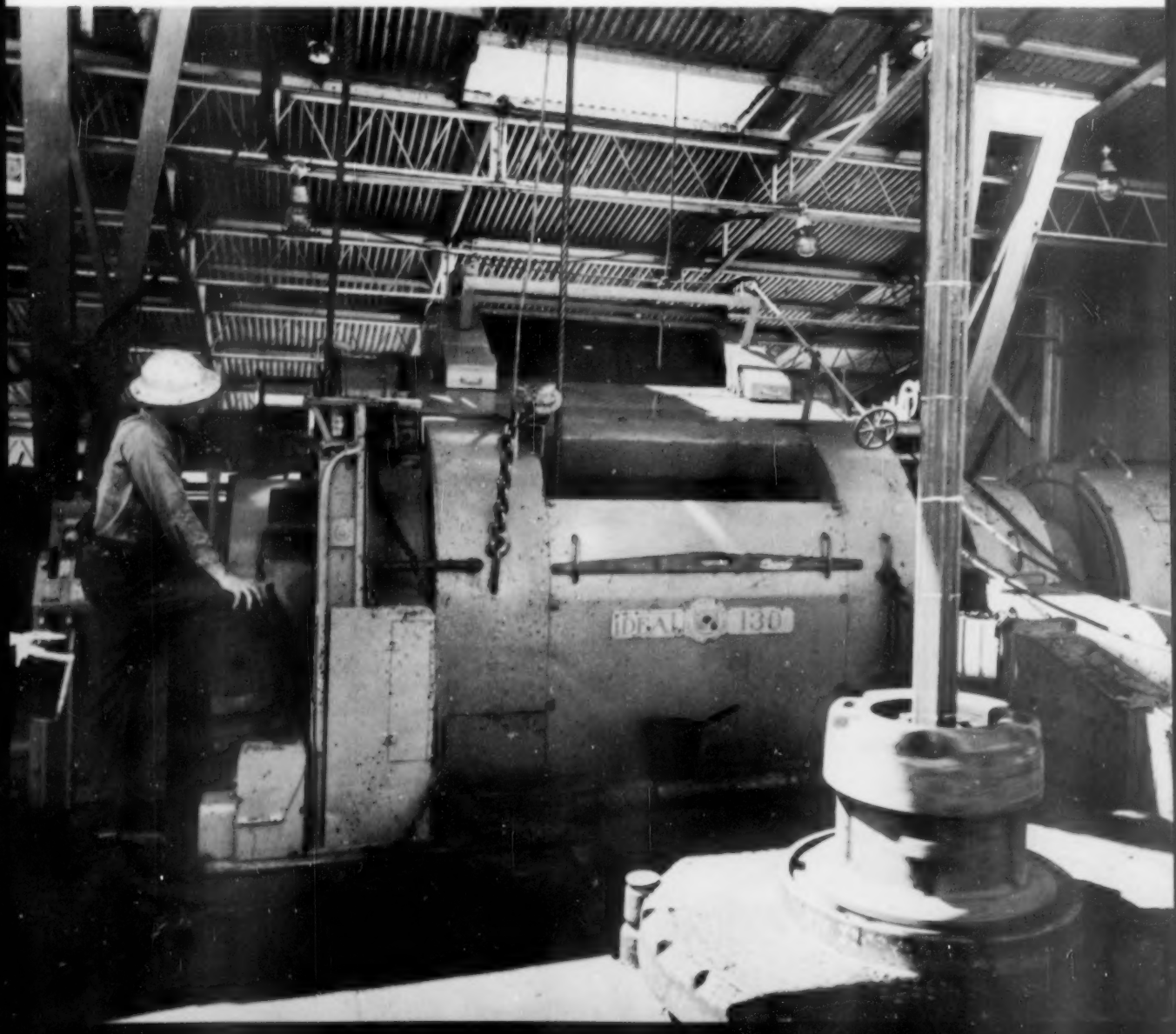
Smooth-running IDEAL® Rigs keep costs low

You can operate the Ideal Rig for your needs in the desert, at sea or just a few miles from home—it will do the same dependable job for low-cost footage everywhere. That's because it's engineered for smooth, fast operation, and has all the modern features you require in a trouble-free rig.

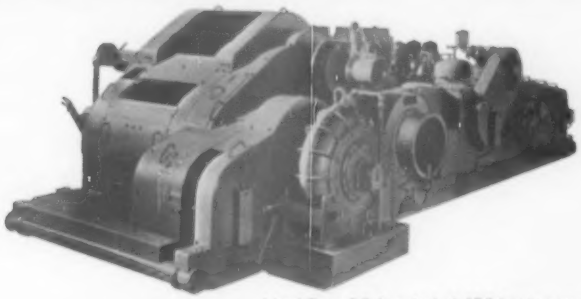
Take the Ideal Type 110 on the next page as an example. Its compact construction, large drums and features for easy operation are typical of all Ideal Rigs. So, too, is the special sectionalized design that makes it easy and economical to move anywhere. It has National's own Dy-A-Flex clutch, exclusively designed for rugged oilfield service—and all working parts are easily accessible. In these and other construction details you get the convenience that means ease in handling, control and routine operations—including maintenance.

Every Ideal Rig is backed by National's continuous research and years of close cooperation with practical operators the world over. Remember, too, that wherever you operate an Ideal Rig, you're not far from the prompt service which is available through National's extensive field supply network.

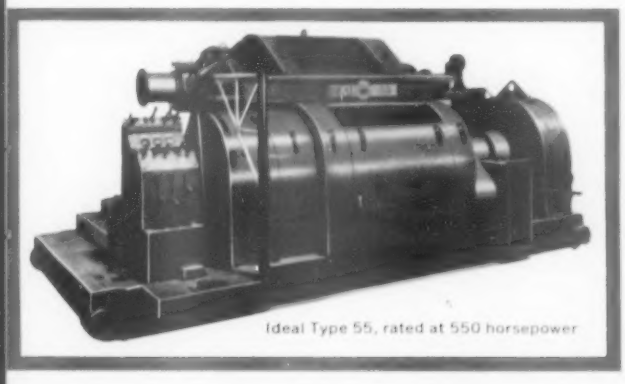
Let the National Supply representative in your area tell you more about the Ideal Rig that can keep your drilling costs low!



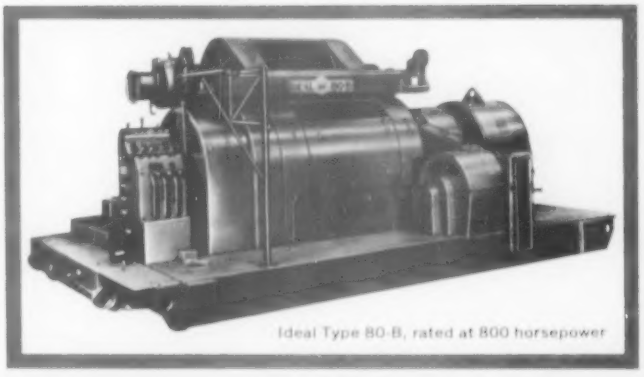
. . wherever you operate!



Ideal Type 50-A, rated at 450 horsepower



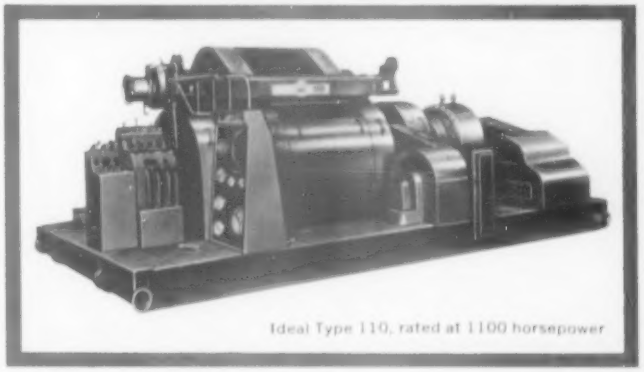
Ideal Type 55, rated at 550 horsepower



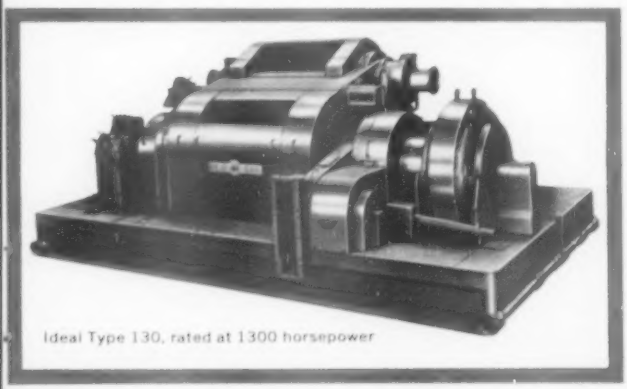
Ideal Type 80-B, rated at 800 horsepower

The big rigs for your big jobs

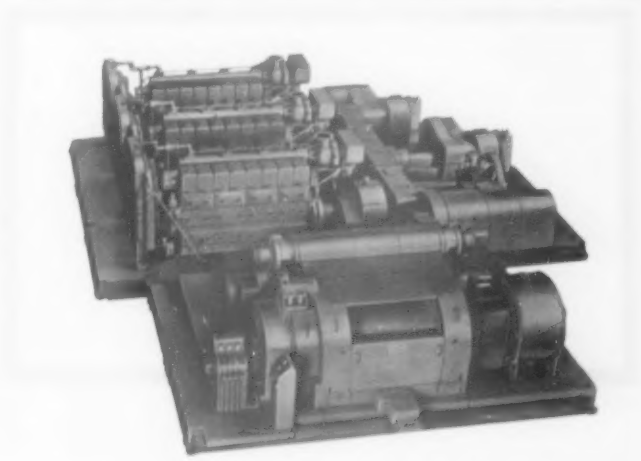
There's a smooth-running Ideal Rig for every drilling job—and these six cover the range of the "big" jobs from medium-depth to deepest drilling. Each has been developed for the most efficient operation at rated capacity, and is built for long, hard service. Four other rigs, designed to operate from trucks and trailer mounts, make up the balance of National's complete 10-rig line.



Ideal Type 110, rated at 1100 horsepower



Ideal Type 130, rated at 1300 horsepower



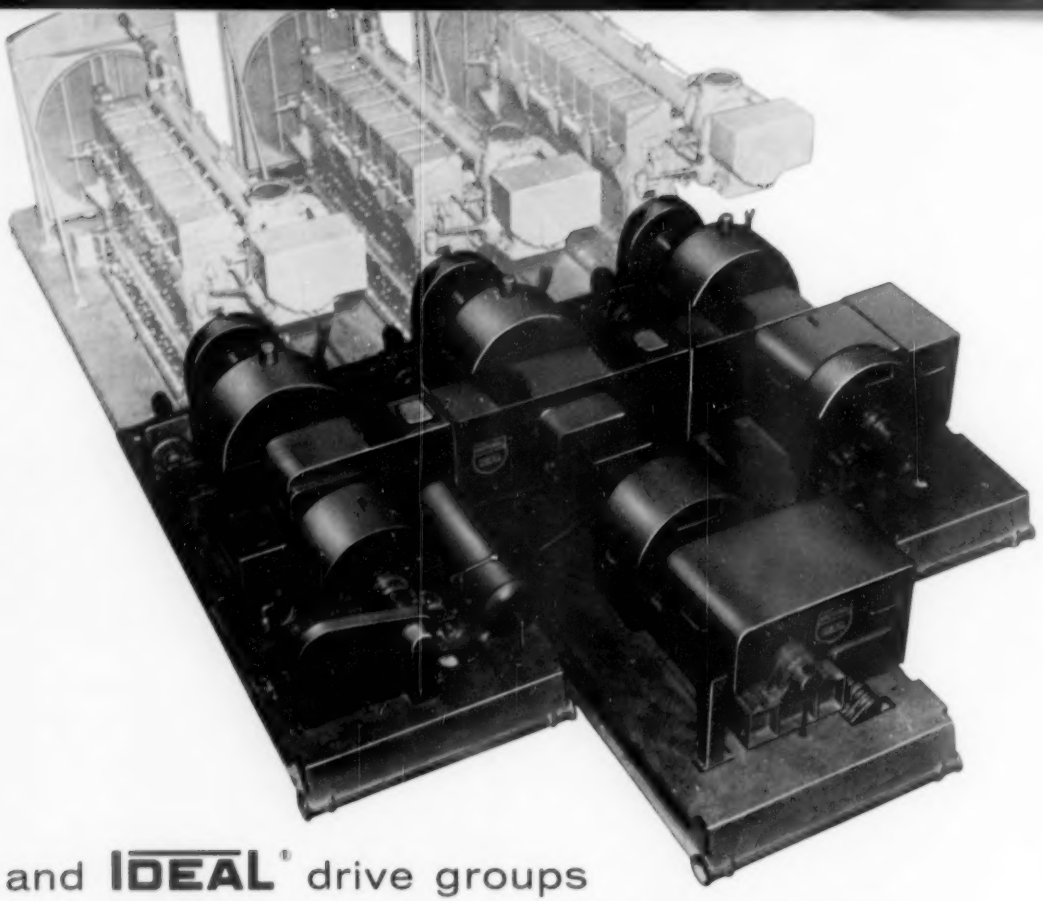
Ideal Type 160, rated at 2000 horsepower

THE
NATIONAL SUPPLY
COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1

NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

Some "balanced rig" advantages on the next page . . .



. . . and IDEAL® drive groups insure smooth power transmission

You'll have the full advantages of a balanced rig when you match integrally designed Ideal Drive Groups with your Ideal Rig. Compact and easy to transport, Ideal Drive Groups are easy to rig-up and disassemble . . . and they provide dependable power transmission under all drilling conditions.

Be sure to get complete details on these outstanding features of Ideal Drive Groups—

Sectionalized construction, with each section a completely self-contained portable unit.

Wide power range, with flexible engine and drive combinations from 200 to 2000 horsepower.

Slush pump drives, available for one, two or more pumps with either single or 2-speed drive.

Three types of transmissions—a choice of mechanical, Ideal Gyrol Fluid Drive or National Torque Converter.

Bulletins on Ideal Drive Groups and Ideal Independent Pump Drives are available at the nearby National Supply Store.

THE
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COMPANY

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DIVISION OFFICES: Denver; Ft. Worth; Houston; Toledo; Tulsa; Torrance
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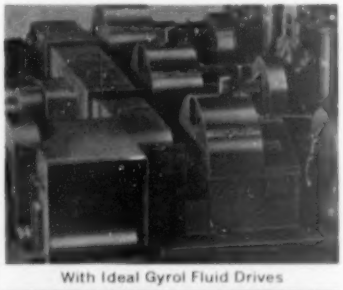
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT



With Ideal Gyrol Fluid Drives

With National Torque Converters

BUS TRANSPORTATION is big business in the U. S. today. Millions of American travelers have found it safe, comfortable, punctual, dependable. Over the years, the men who manage America's bus lines have worked hard to bring their industry to this high degree of efficiency. And we of The Texas Company are proud that so many of them have called on our specialized skills to help them. In fact . . .

More chassis, wheel bearings, transmissions and differentials of buses in the United States are lubricated with Texaco Products than with any other brand.

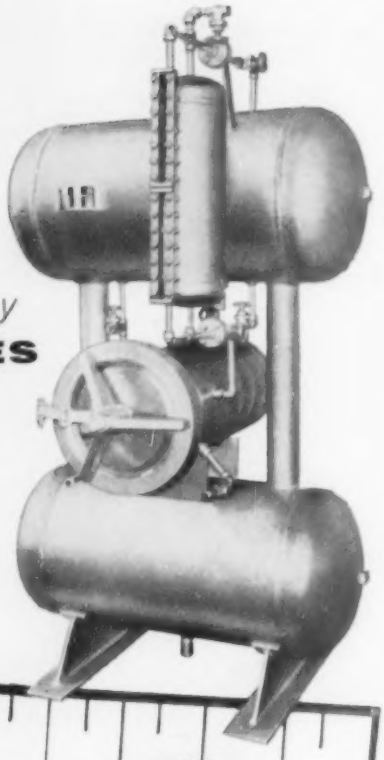
TEXACO

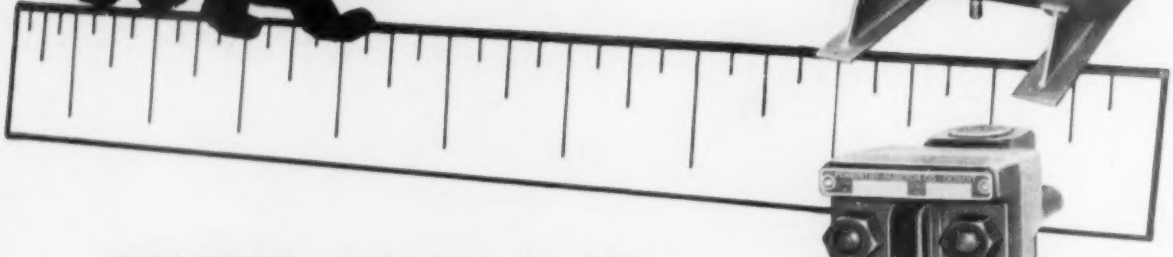
THE TEXAS COMPANY

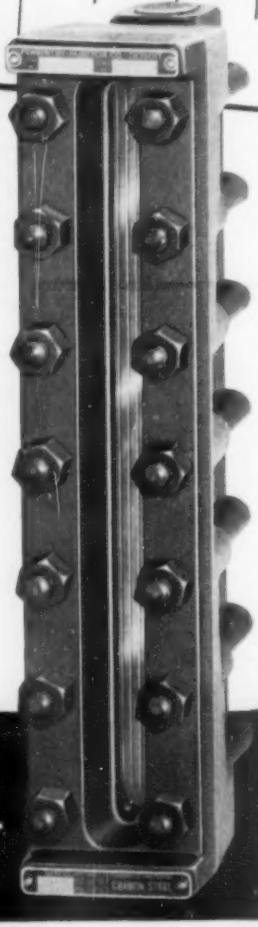
TO MEASURE SMELL....

Peerless Manufacturing Company uses **PENBERTHY GAGES**

The Peerless Type "MP" natural gas odorizer, shown here, is a complete packaged unit which can be installed easily. Hundreds of such installations are providing constant odorizing despite variations in flow, temperature and pressure. .







IMPORTANT to the Gas Companies, from a liability standpoint, is the dependable means of maintaining accurate records of daily odorant consumption. This is done by means of the Penberthy Reflex Liquid Level Gages . . . shown mounted on the small calibration tank. Two calibration scales are attached to the gage glass. One records gallonage in the large storage tank and the other in the small.

Like Peerless, other equipment manufacturers depend upon Penberthy Gages for clear accurate readings, durable service and minimum maintenance. This is because of the extra exclusive features incorporated into the advanced engineering and construction of Penberthy Gages and Gage Valves. Let us send you complete detailed information on the complete line.

WRITE FOR YOUR COPY OF CATALOG 35.

PENBERTHY MANUFACTURING CO.
Division of the Buffalo-Eclipse Corporation
1242 Holden Avenue Detroit 2, Michigan

There's certain satisfaction in **PRODUCTS BY** PENBERTHY

- GAGES
- EJECTORS
- EDUCTORS
- EXHAUSTERS
- SYPHONS
- ELECTRIC SUMP PUMPS
- CYCLING JET PUMPS
- INJECTORS

Use SpringKore flexibility and crush resistance to cut your rotary drilling line costs

J&L SpringKore Rotary Drilling Lines are designed with a tightly coiled, high quality steel spring center that replaces independent wire rope or hemp fiber core. The SpringKore center gives rotary drillers a wire rope with unusually high resistance to crushing action *plus* extreme flexibility.

Check these SpringKore features and see why J&L SpringKore gives you longer service life on your rotary rigs.

LONG-TERM FLEXIBILITY
SpringKore's highly flexible center and wide distribution of internal pressures maintains original rope flexibility under long periods of heavy-duty service.

RESISTS CRUSHING ACTION
Coiled steel spring center has great resistance to crushing . . . snaps rope back to its original shape and diameter.

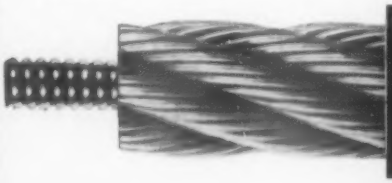
COMPLETE LUBRICATION
SpringKore's hollow center acts as a lubricant reservoir . . . reduces corrosion and friction wear by assuring lubrication of innermost parts of rope.

MORE SUPPORTING CONTACT POINTS
The coiled shape of the spring center gives the strands of the rope more supporting points . . . reduces friction by spreading pressure evenly over many contact points.

UNIFORM DIAMETER
The firm internal support provided by the spring center maintains uniform rope diameter . . . reduces wear caused by outer strands rubbing against each other.

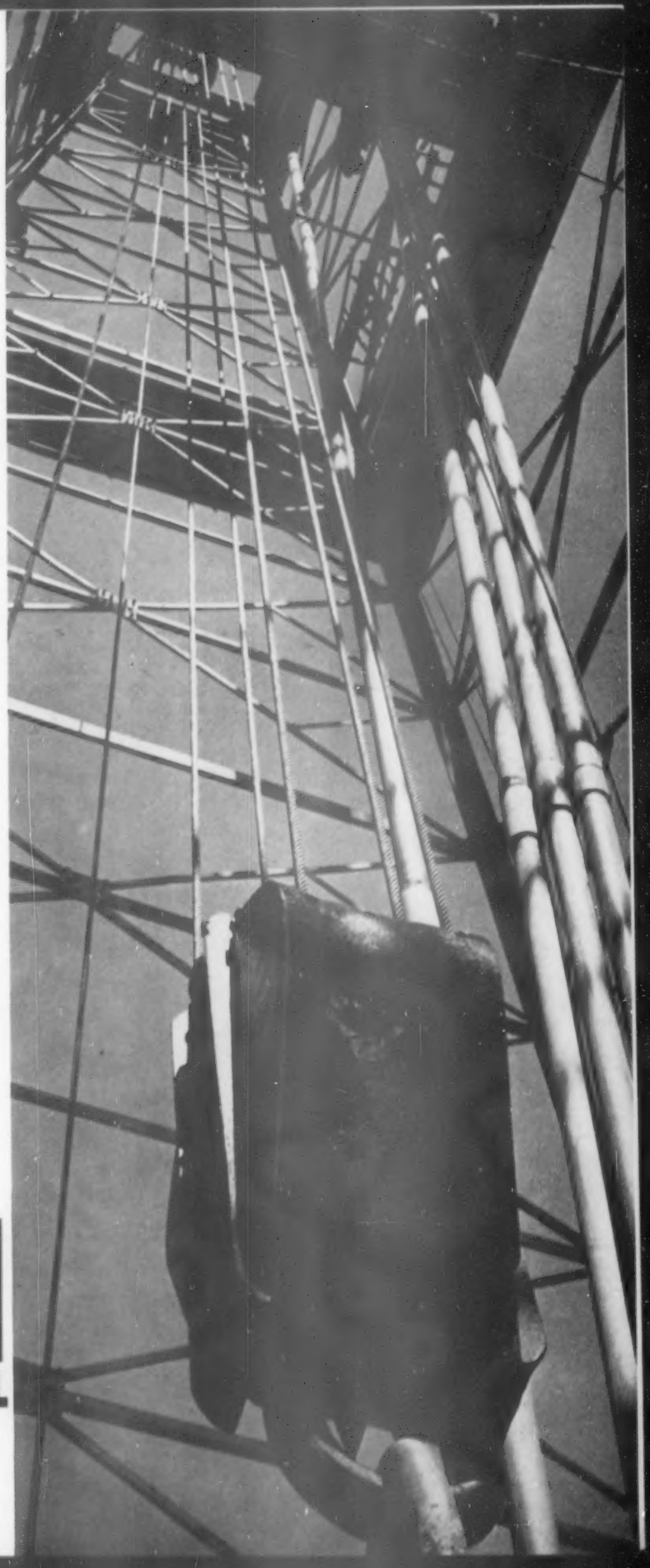
LESS INSIDE STRAND WEAR
The spring center flexes under crushing instead of scoring strands . . . reduces wear on inside wires.

Put these SpringKore advantages to work on your rotary drilling rigs. Specify J&L SpringKore Rotary Drilling Lines. Available in standard sizes and construction.



J&L STEEL

Jones & Laughlin
STEEL CORPORATION · PITTSBURGH



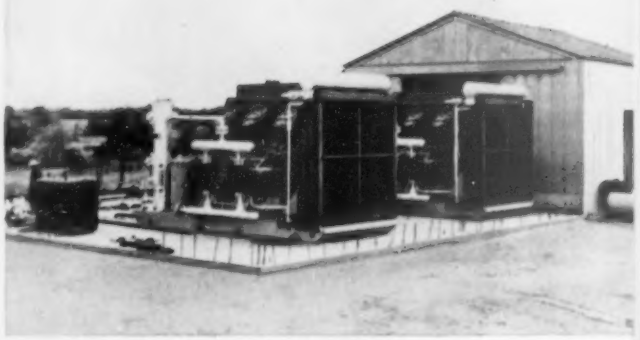
FLEXIBILITY OF PARKERSBURG STEEL BUILDINGS

is the answer to economical expansion

AFTER

The "before" photograph shows a low-cost Parkersburg Steel Building housing the original compressor station installation. As additional compressor units were required Parkersburg standard building units were quickly added to provide complete housing for this station as indicated in the "after" picture.

This is another example of how the unlimited flexibility of Parkersburg Steel Buildings economically solves expansion problems in the oil and gas industry . . . and at the same time provides sturdy housing that will last for years with practically no maintenance.



BEFORE

Plan now for the *future* with flexible Parkersburg Steel Buildings. There's a size and style to meet your every requirement, today and tomorrow.

Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

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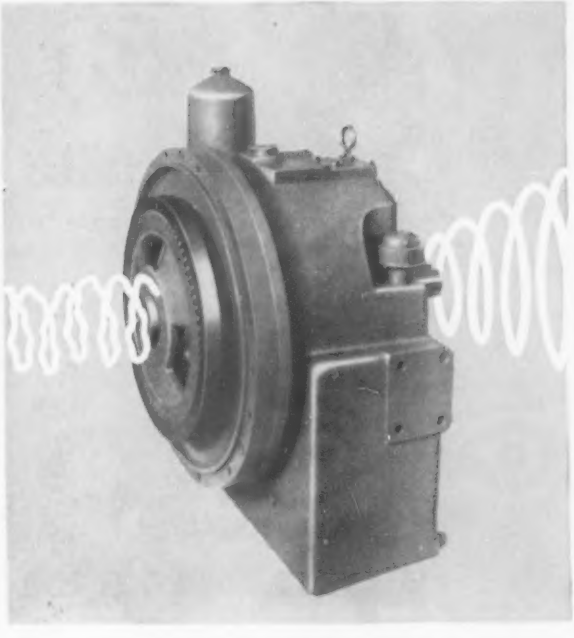
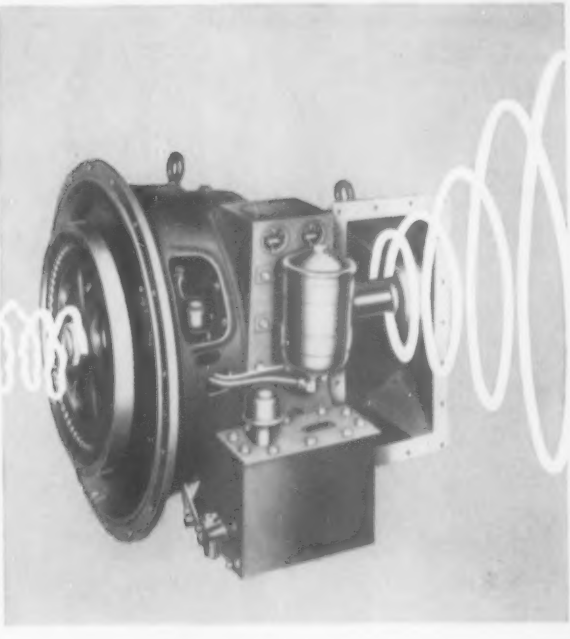
FORT WORTH 16, TEXAS

5622

Single-Stage or Three-Stage Torque Converters?



Single-Stage Torque Converter



Three-Stage Torque Converter

The answer to this question depends largely upon the characteristics of the equipment you manufacture *or* use and the jobs it is required to do. Naturally, many factors must be known before any engineering department can be expected to make recommendations.

Generally speaking, however, when it is desired to have minimum pulldown from governed engine speed—with maximum power output over a wide range—and to produce high torque ratios for hoisting or heavily loaded vehicles, a three-stage torque converter, with torque multiplication up to *six times,* may be most desirable. On the other hand, where mild torque conversion is required, as in certain types of vehicles and in other industrial equipment — a single-stage converter may be the best choice.

Now, for the first time, you can benefit from the *unbiased recommendations* of one manufacturer in choosing a torque converter—*single-stage or three-stage* — with the exact capacity and torque transmission characteristics to give your equipment *maximum efficiency.*

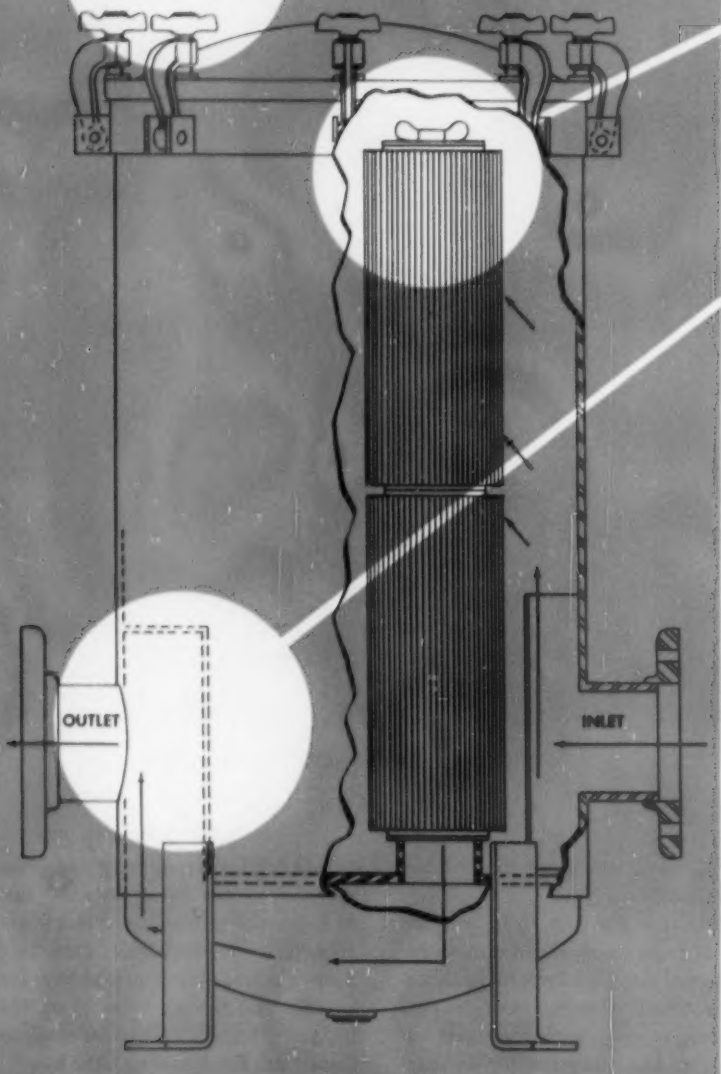
The Twin Disc Clutch Company's new line of single-stage torque converters—now available in the 1500 Series—complements its time-tested, universally accepted line of three-stage units. Single-stage *or* three-stage—from 30 to 1000 hp—you can depend on Twin Disc Torque Converters to give your equipment better performance . . . less downtime . . . and greater earning potential.

In addition to offering *the most complete — the most versatile* line of industrial torque converters available, Twin Disc manufactures fluid couplings in a wide range of sizes for engines and motors from ¾ to 850 hp, and friction clutches for applications from fractional to 1050 hp.

For *smooth, dependable* transmission of power to *your* oil field equipment, *standardize* on Twin Disc—the world's largest manufacturer of fluid and friction drives for powered industrial equipment. For complete details, call the Twin Disc District Office nearest you: Tulsa, GIbson 7-1578; Dallas, RIverside 3014; Los Angeles, LOgan 8-3309.

TWIN DISC CLUTCH COMPANY
Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

NOW! In ONE Filter



Easy Servicing

Just a twist of the wrist and the top swings open. No special tools needed; eliminates nuts and bolts; no busted knuckles.

Best Performance

PETROLEUM MARKETING FACILITIES: truck loading racks, aircraft fueling, fuel oil bulk plants.

MACHINE TOOLS: coolants and cutting oils, hydraulic oils.

INDUSTRIAL PLANTS: solvents, oils, water and other non-corrosive fluids.

WITH THE

New Excel-So

57 SERIES FILTERS

Check these advantages • Simplified construction—low initial cost • Reduced size for compact installation • Quick opening cover and provision for instantaneous cartridge change • Improved filtration efficiency and greater dirt holding capacity . . . result . . . low cost maintenance • Very low initial pressure drop • Available for vertical or horizontal installation • Location of inlet and outlet connections to customer specifications • Wide range of product applications • Units in standard design or for code requirements • Non-ferrous construction available • Extra accessories including air eliminator, pressure gage, dump valve, etc., available.

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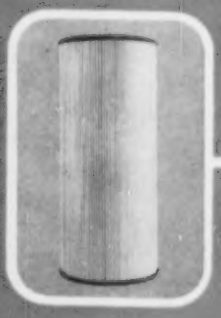


CH-57PL PLEATED CARTRIDGE

THE NEWLY Developed CH-57PL Cartridge combines

- Larger Outside Diameter
- Larger Inside Diameter
- Greater Height

RESULT

- More Filtration Surface
- Lower Operating Cost
- Higher Flow Rates

Write for bulletin WL-6-56

They Say—

Sampling Series Approved

Gentlemen:

In behalf of the authors as well as the members of the Sampling Section of American Society for Testing Materials Committee D-2, I wish to extend thanks to you for the excellent job done by The Oil and Gas Journal in reprinting the papers presented at the A.S.T.M. symposium on automatic sampling. We liked particularly the title, "Don't Sell Sampling Short," which you gave the series.

J. H. Berglund
Secretary, Research Division II
On Measurement and Sampling,
American Society for Testing Materials
Linden, N. J.

No Injury Goal Is Possible

"So long as a single employe is seriously injured at work we cannot be satisfied. That a goal of no injuries is entirely realistic and can be achieved is borne out by the fact that 70 of Du Pont's plants and laboratories operated throughout the year 1955 without a single disabling injury."

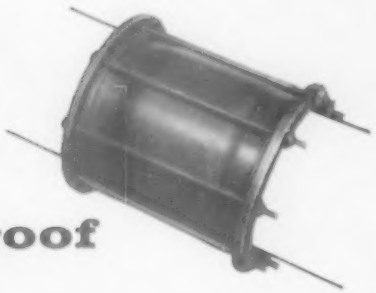
Robert L. Richards, vice president, E. I. du Pont de Nemours & Co., in a message to employes.

Questions Follow Trans-Canada

"Is the cross-Canada gas line going to make monkeys out of the government? The most ferocious political battle of the age was generated by the Ottawa policy on this matter. The basic argument justifying the Ottawa policy was the need for speed. If speed were no consideration, then it might have been argued that the pipeliners could have been left to sweat out their own problems without Ottawa's help.

"Now . . . an ominous question mark hangs over the whole business. Perhaps the line won't get to Winnipeg by this year's end. If it doesn't a fresh torrent of political fireworks can be expected and certainly there will be pain and embarrassment for the government.

"...Was Trans-Canada really anxious to do the job this year? Or did it want all the government help it could wangle, then have time for more infighting at the Federal Power Commission hearings, more time to fiddle on the problem of financing, and more time for the gas market to grow? Trans-Canada may deplore it, but the



for
vibration-proof
connections
join pipe
THE DRESSER WAY!

Dresser Couplings or Long Sleeves provide the necessary "give and take" to absorb vibration, settlement and other stresses. They're the handiest, surest, safest way of making perfect joints wherever you're joining pipe.

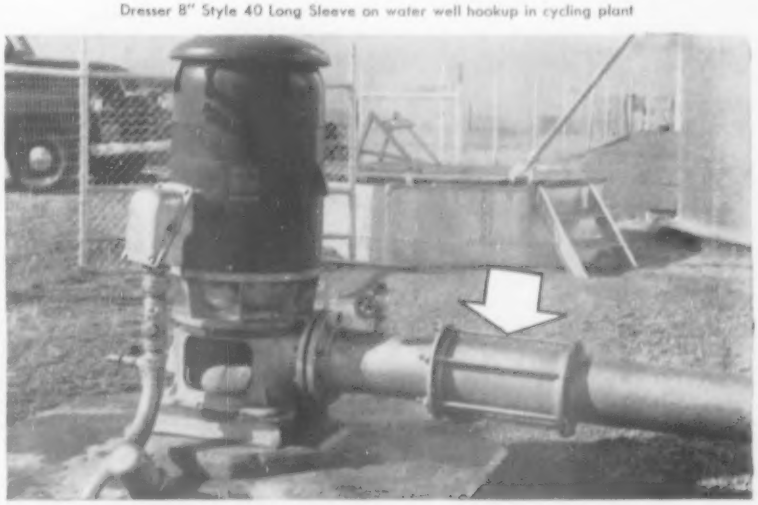
Specially compounded rubber gaskets permit up to 4° deflection at joints—yet with Dresser Couplings these joints stay permanently tight.

Any workman can install Dresser Couplings, averaging only two man-minutes per bolt. The only tool needed is a wrench. Pipe threading is not necessary.

AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES IN THE UNITED STATES AND CANADA

DRESSER®
Dresser Manufacturing Division • Bradford, Pa.

Dresser 8" Style 40 Long Sleeve on water well hookup in cycling plant



Style 38 Coupling

Style 40 Long Sleeve

Hydrepair® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

BAKED-ON PLASTIC COATINGS

GIVE TOP-TO-BOTTOM PROTECTION AGAINST CORROSION IN GAS LIFT AND FLOWING WATER-DRIVE WELLS

Tubular goods coated with PLASTICAP are shielded from top to bottom in a tough, resilient film that prevents contact between metal and fluid. Because it never reaches the pipe, water-dependent corrosion simply never has a chance to begin.

In addition to being the most complete and the most permanent method of controlling corrosion, PLASTICAP Coatings also are the most economical. Regardless of how much fluid is produced, the original cost never increases. On a per-barrel basis, the cost actually goes down as total production goes up.

Get full information on PLASTICAP top-to-bottom protection against corrosion. Fill in the form below and mail today. Two coatings to meet your conditions . . . two plants to serve you.

PLASTIC APPLICATORS, INC.
HOUSTON, TEXAS HARVEY, LOUISIANA

PLASTIC APPLICATORS, INC., P. O. BOX 7631, HOUSTON, TEXAS

Please send information on PLASTICAP BAKED-ON COATINGS.

NAME _____

COMPANY _____

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fact is that unpleasant questions of that kind are being voiced.

". . . C. D. Howe (Minister of Trade and Commerce) and his associates have gone right down the line to help the pipeliners perform this year. For that, the government has taken terrific political punishment. The pipeliners will be wise indeed to demonstrate by every means possible their real sincerity of purpose and their exploitation of every possible means of catching up on the pipe delivery slow-down.

Editorial in the Toronto Financial Post.

This "Risky" Oil Business

" 'I wish I had an oil well!' "

"You've heard that said a thousand times — probably you've said it yourself.

"And there is no doubt that a big producing oil well would be a nice thing to have. At the same time, getting an oil well, and then making something valuable out of the crude, is a mighty expensive and risky business.

"For instance, last year oil producers spent more than $2.5 billion drilling some 55,000 wells in this country. A great many of them turned out dry and useless. One well, in Louisiana, was sunk to a record 22,570 ft.—more than 4 miles—before traces of oil were found. The cost was $2.4 million.

"Much oil now travels by pipeline—and it costs about $32 thousand to lay just 1 mile of 12-in. pipe.

"Modern gas engineers demand fuel of much higher octane than used to be the case—the average octane rating of gasoline has risen from 74 to 84 in the last 26 years. It costs oil companies $500 million to improve gasoline quality by just one octane number.

"The oil industry offers rewards and, with them, great risks."

Editorial from the Oil City, Pa., Derrick.

Price Outlook Uncertain

"Most industries using steel were able to weather the 4-week steel shutdown without much discomfort. But that wasn't true of the oil industry which was in trouble immediately because it was in the midst of a heavy expansion program requiring particular types of steel not always in ready supply.

"Traditionally, the industry has trouble passing along its cost increases. Whatever increased prices it must pay for steel are going to be hard to pass along to the consumers who already are beginning to complain about the high cost of gasoline. The industry can point out that much of the recent increase is due to higher gasoline taxes . . . but this

is a somewhat academic point with the consumers. . . . There are other uncontrollable factors with which the oil industry must reckon in trying to cope with its rising costs. . . .

"The higher gasoline prices and taxes rise the less likely the motorists are to increase their use of petroleum products. That makes for an uncertain outlook and in part explains the intermittent gasoline price wars in some areas."

Editorial in the Daily Oklahoman, Oklahoma City.

Inflation Hurts Steel Industry

"To play our full part in meeting America's steel requirements means that United States Steel is going to have to expand its capacity by an average of at least 1 million tons each year . . .

"Before we can even talk about expansion, however, we must first arrange to keep our present facilities intact. We must replace those that wear out, and modernize those that become obsolete. And this, today, is our most difficult problem. That is where inflation has hurt us the most . . .

"During the past 10 years, our plant and equipment costs have more than doubled . . .

"Our engineers tell us that during the next 5 years we will have to spend an average of $350 million each year on replacement alone. That is at present construction costs . . .

"To the problems which past inflation has left with us—and in light of the possibility that even if slowed, inflation will continue to some degree—I see only two possible solutions . . .

"The first, and most logical, is to revise the depreciation provisions of the law. And the other alternative is larger profits . . ."

U. S. Steel News, July, by Roger M. Blough, chairman of the board of United States Steel Corp.

CALENDAR

SEPTEMBER

4-11 International Geological Congress, Mexico City.

5-7 Wyoming Geological Association, eleventh annual field conference, Jackson Lake Lodge, Moran, Wyo.

7-8 Association of Desk and Derrick Clubs of North America, annual convention, Roosevelt Hotel, New Orleans.

9-11 Independent Natural Gas Association of America, annual membership meeting, St. Anthony Hotel, San Antonio, Tex.

9-12 American Institute of Chemical Engineers, William Penn Hotel, Pittsburgh.

11-13 Pacific Coast Gas Association, annual meeting, Hotel del Coronado, Coronado, Calif.

12-14 National Petroleum Association, an-

Every oil magazine . . . every newspaper and news magazine . . . points up the tremendous job that Joe Roughneck is doing to supply the fantastic quantities of oil and gas required today.

Joe, symbolic spirit of the oil industry, may be on a rig in the field or running a company from the home office . . . but he knows oil and pipe.

We, at Lone Star, are glad to have him know, also, that we are enlarging our huge plant again in order to supply more API casing, tubing and line pipe.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

Lone Star STEEL COMPANY

LSS

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Announcing . . .

Alexander Shipyard

changes name to

American Marine Corporation

Alexander Shipyard, Inc. of New Orleans is moving forward under a new name, American Marine Corporation, with the announcement of a reorganization-expansion program to meet the growing shipbuilding and servicing needs of the Gulf Coast area. The expansion program is in full progress with recent additions of a new gas freeing plant, a 1500 Ton floating drydock, a 50 Ton floating derrick, and a new 16 ft. 600 Ton hydraulic press for forming steel plates. As a result the American Marine Corporation becomes equipped to do an even better job than its noted forerunner in the design and construction of offshore and inshore drilling barges and tenders, tugs and work boats; and in the servicing, repair, and maintenance of all types of river and Gulf marine equipment.

The company continues under the management of Leslie B. Durant. It remains dedicated to provide for the expanding needs of the Gulf Coast Area in the design and construction of marine equipment.

P. O. Box 8126

AMERICAN MARINE CORPORATION

New Orleans 22, La.

VA. 2408

nual meeting, Traymore Hotel, Atlantic City, N. J.

16-18 Pennsylvania Petroleum Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

16-18 New Mexico Petroleum Industries Committee, annual convention, Hilton Hotel, Albuquerque.

16-21 American Chemical Society, 130th annual meeting, Atlantic City, N. J.

19-21 Southeastern Gas Association, Hotel Sir Walter, Raleigh, N. C.

16-21 American Society for Testing Materials, second Pacific area national meeting, Statler Hotel, Los Angeles.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

20-22 Oklahoma City Geological Society, field conference, Guymon, Okla.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

1-5 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

3-5 Standards Engineers Society, fifth annual meeting, Hotel Willard, Washington.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

8-10 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

9-10 Southwest Kansas Petroleum Industry and University of Kansas, fourth annual two-day gas measurement institute, Liberal, Kan.

10-12 International Geological Symposium of the Williston Basin, Bismarck, N. D.

11-12 California Natural Gasoline Association, fall meeting, Sheraton Huntington Hotel, Pasadena, Calif.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

14-20 OIL PROGRESS WEEK.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

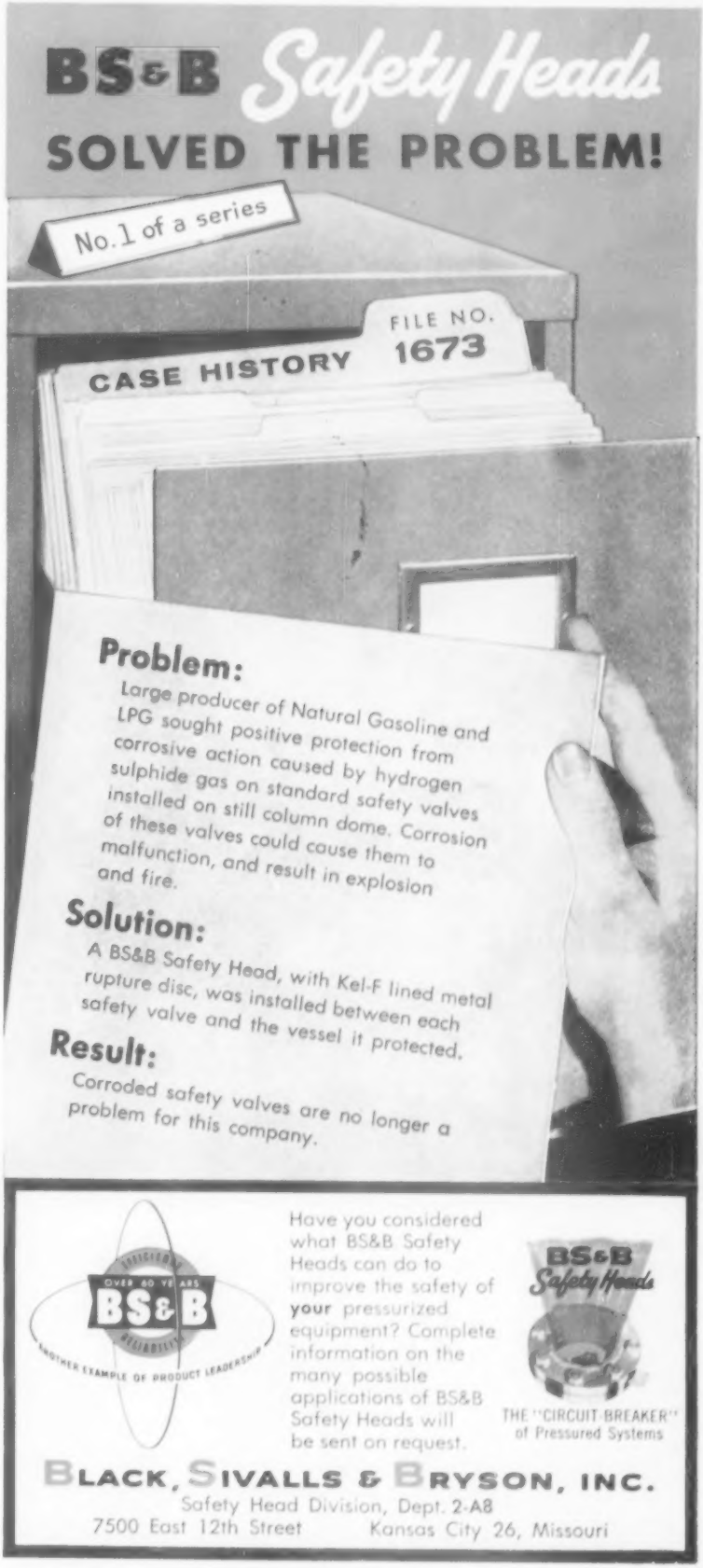
18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Tex.

22-24 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

23-26 National Association of Corrosion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Engineers, south central region, San Antonio.

24-26 Tracerlab Symposium on Applications of Radioactivity, Hotel Statler, Boston.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention, Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-27 Kansas Independent Oil and Gas Association, nineteenth annual meeting, Broadview Hotel, Wichita.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

29-Dec. 1 Interstate Oil Compact Commission, annual meeting, Allis Hotel, Wichita.

DECEMBER

3-4 New Mexico Oil and Gas Association, annual meeting, Alvarado Hotel, Albuquerque.

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

1957

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

21-55 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

FEBRUARY

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

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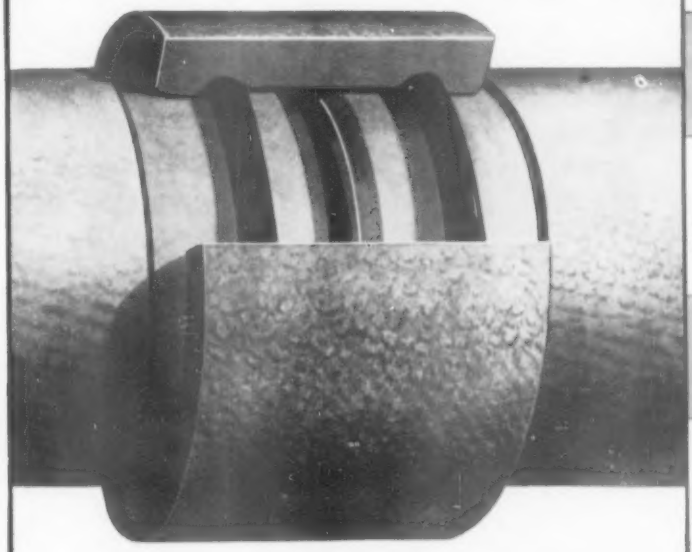

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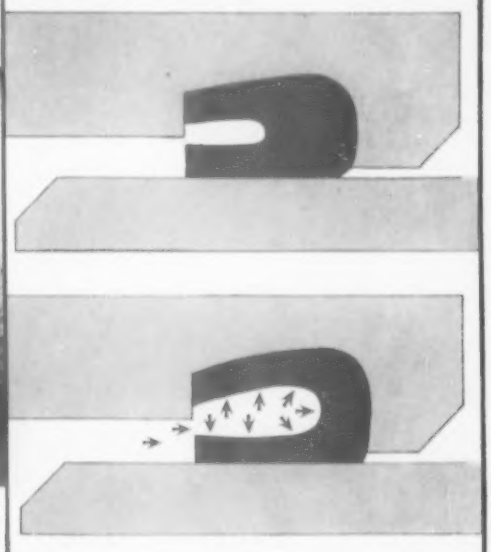

ACTION OF FLUID PRESSURE ON SEALING RINGS. Fluid enters pipe; internal pressure on holes in sealing rings causes rings to expand. The greater the pressure, the tighter the seal.

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A three-man crew recently made up over ⅛ mile of six-inch "Century" Asbestos-Cement Pipe in 1¾ hours. Their accomplishment is believed to be a record, especially since the pipe was laid in mud under weather conditions which might ordinarily have washed out the whole operation.

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Write today for Bulletin No. A-C 456 giving full details on the new Fluid-tite Coupling. You will also receive a free copy of the Asbestos-Cement Pipe Flow Chart, hole punched on heavy board for your notebook.

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TULSA, OKLAHOMA

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Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00; 3 years, $8.00. Single copies; regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1956 by The Petroleum Publishing Co.

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JOURNALLY SPEAKING . . .

Ink Well

WHY a picture of a drilling rig on this page? Pictures of drilling rigs are a dime a dozen in any oil magazine.

There's nothing special about this rig—just an ordinary truck-mounted coring or shot-hole rig.

It's working in a city, but what of that? Lots of oil wells are drilled in cities.

The special thing about this rig is that it's drilling right next door to The Oil and Gas Journal's building in Tulsa.

So now we're going to have an oil well all our own, after writing about other peoples' drilling operations for more than 50 years?

Nope. No such luck. But we are going to have something that will serve us—and our readers—a lot better: a new building.

This rig is drilling through the pavement of an abandoned filling station to test for foundations for a big new addition to the Journal's plant.

What will come out of this plant won't be oil, but ink—printers' ink telling all about the oil industry every week. Of course we won't actually get ink out of the well pictured here, but on the foundations to be based on these core tests will rise a structure in which we will process ordinary printers' ink into a full report of the oil industry's most significant doings every week.

We've been doing that for nearly half a century in practically the same spot, but we'll be able to do it even better in our enlarged quarters.

When The Oil and Gas Journal moved to Tulsa in 1910 it occupied part of the first floor of an old rooming house—presses, linotypes, editors, business office, and all. But as the oil industry grew, so did the Big Yellow Book. It took over the whole building. Then what seemed like a big addition was built on the back.

But in 1939 the space was doubled by an "L" extending out to the other street. When this "new" building was occupied the staff rattled around in its vast open spaces and wondered if it could ever be filled up. Now every inch of all three buildings—and much additional rented space—is jam-packed with printing equipment, desks, and all the people and paraphernalia it takes to turn out the biggest magazine in the world.

Our nine modern printing presses work around the clock and often on week ends, and there's no space to install another one. And upstairs the desks of editors and other workers are crowded so close together that the mail boy has to climb over people to make his rounds.

So now we've acquired the three lots in the hollow of our "L." The old filling station and two other buildings are being torn down. When the new addition is joined to the old structures, and the old parts modernized, we will be doing our weekly stint in a streamlined plant covering a solid quarter block.

Drop in and visit our new home on the old homestead, and note how we keep up with the oil industry not only in growth but also in efficiency. But don't come for several months. You know how long it takes these builders to finish anything.

—*Henry D. Ralph.*

"All set"

Each Baker Centralizer Spring is carefully formed with a bowed height that is greater than it should be for its length . . . in accordance with Baker's original Optimum Centralizer Spring Design. The spring is then *pre-set* by being completely flattened in a press and allowed to return to the exact bowed height specified by the Optimum Spring Design. Since this specified bowed height of the springs will not thereafter be materially lessened due to permanent set . . . even when the centralizer passes through tight spots or dog-legs in the hole—the *net effective reach* to center the casing is present when cementing is started. You are *all set* for best results.

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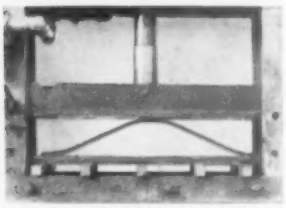
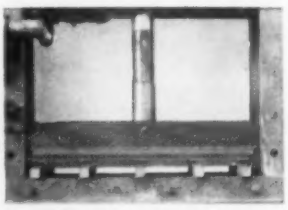
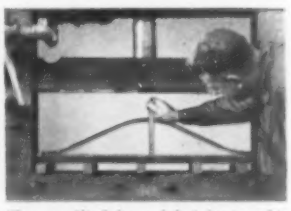


Spring in position in hydraulic press for flattening test.



The tightest hole could not flatten any spring more than this.



The specified bowed height (reach) must be present after the slight permanent set.

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New proration ideas are in order now

IN this period when there is too much crude oil, and when major emphasis is on prorating production to market demand, it is encouraging to see some states giving attention to other aspects of conservation.

In spite of all the fuss made over it, market-demand proration is, after all, a minor part of a conservation system. It is concerned only with avoiding aboveground waste.

The major problems of conservation concern underground waste, maximum ultimate recovery, and protection of correlative rights. Regardless of the condition of the crude-oil market, states should gear their field operating rules to limiting output to the maximum efficient rate of production, to encouraging maintenance of reservoir energy and secondary-recovery projects and to assuring equity among surface owners.

A NOTABLE EXPERIMENT in conservation is being tried by the Colorado Oil and Gas Conservation Commission. It is attempting to prorate Adena field on the basis of oil and gas in place. This is the first time this method has been used by any state agency as a means of protecting correlative rights.

The Adena order is under attack, and—like most milestone cases in the long and troubled history of conservation—it may prove to have some serious engineering, legal, and economic shortcomings.

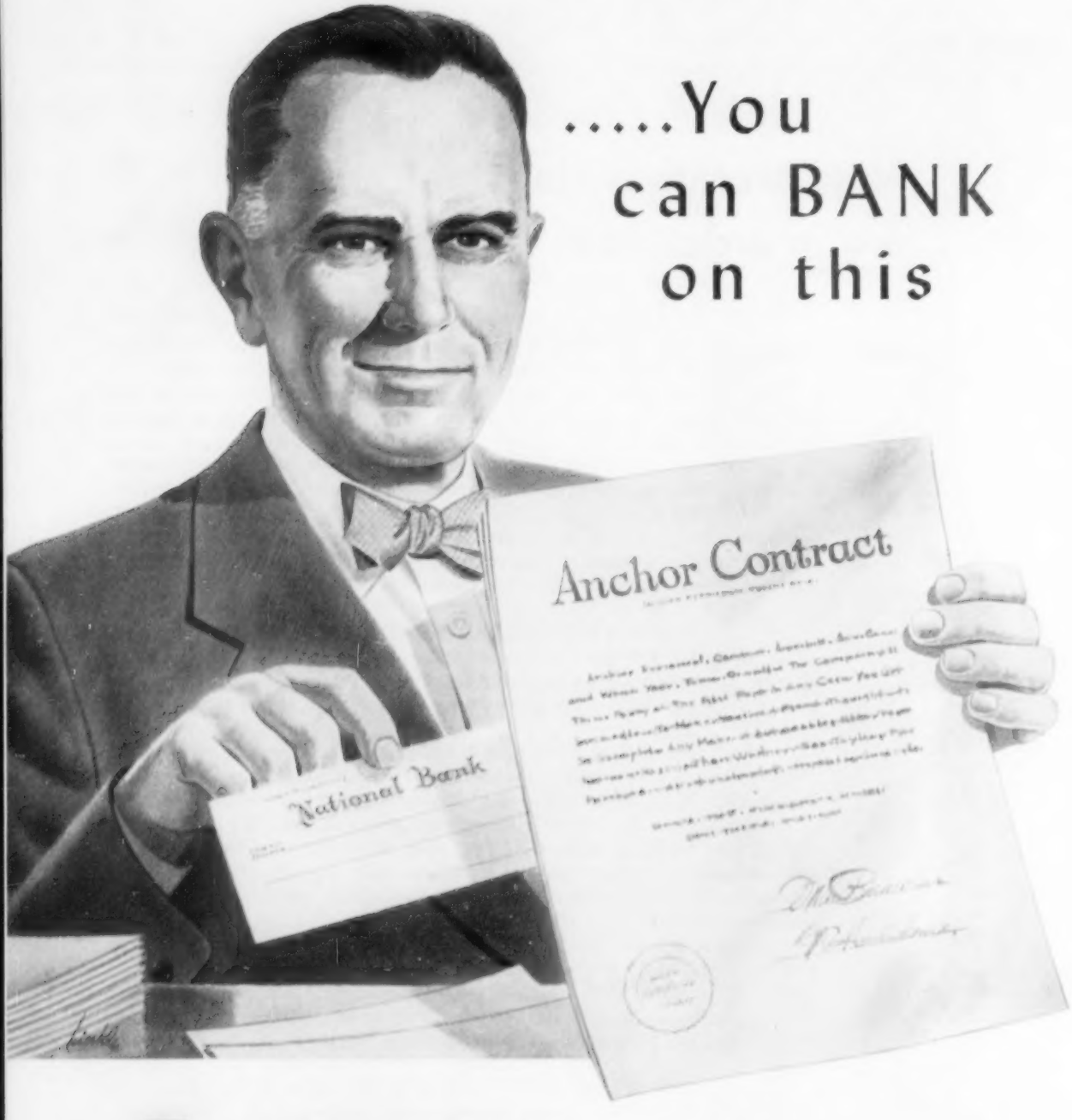
The point is that here is an entirely new concept. It is well worth watching by the entire industry. In the past, allowables have been set on all sorts of systems and theories—and sometimes without much method at all. It could be that some refinements of this oil-in-place method may get wide application in time.

Other states, too, are beginning to make a critical examination of their proration practices, and to toy with new ideas. Problems of protecting producers' equities while fostering maximum recovery are involved in the various suggested changes in allowables for discovery wells, deep production, water floods, and pressure-maintenance projects.

IT SEEMS TO BE one of the paradoxes of petroleum that greatest progress in conservation methods comes during periods of oversupply. When oil is a bit short the emphasis is all on increasing current production, and concern for future recovery often gets neglected.

So this current oversupply may spur several state bodies into a progressive overhaul of their conservation systems. Periodic modernization is essential to keep abreast of knowledge of reservoir behavior and of changing economic conditions and production practices.

That's why Colorado's Adena experiment is significant. The oil-in-place method may or may not be workable. But if it becomes widely used it might be a step toward achieving a more equitable allocation of production not only within a field but among fields and even among states.



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Current and significant in . . .

The Industry This Week

Industry

• **A cutback in crude imports** is expected to be the recommendation of cabinet fuels committee task force which has closed hearings on the subject. P. 75. While fuel committee closed Washington hearings, first complete picture of 1956 imports was revealed before Texas Railroad Commission. Reports to commission show a 17-20 per cent increase over 1955. P. 66.

Fight over Louisiana's offshore boundary is still raging all over. Federal officials have asked Supreme Court to deny Louisiana request that U. S. suit be dismissed. Committee at Baton Rouge, meanwhile, is trying to work out peaceful settlement. P. 64.

Suez crisis is marked by uneasy calm. While diplomats wrestle over who will operate canal, oil industry steps up its emergency plans. P. 78.

Relief for shortage of oil-country tubular goods now hangs on decision by Defense Mobilization Board on proposed steel-plant expansion. Key to matter is quick tax writeoffs on new plants. P. 72.

Refining

• **Sinclair is bypassing a third grade** of gasoline, but has plans for a new superpremium product. Company will replace present premium with a new Power-X boasting a new additive. Sales will cover 37-state area; start September 11. P. 71.

Fight over proposed sale of Universal Oil Products Co. stock is growing more heated. Independent Refiners Association has asked Justice Department to step in. It claims U.O.P. in hands of adverse interests would further weaken economic position of small refiners. P. 70.

A new 30,000-bbl. refinery costing $25 million is going up at Tokuyama, Japan. On-stream date is next year. P. 79.

Pipelining

• **Magnolia plans to link its Midland-Beaumont products** line to 20 natural-gasoline plants in West Texas for a stepped-up movement of L.P.G. to expanding Gulf Coast refining and petrochemical markets. P. 75.

A 216-mile big-inch looping project is being completed by Tennessee Gas Transmission on its system in Kentucky and Ohio. P. 68.

Exploration

• **Nigeria's first good show of free oil** has been found at Shell-British Petroleum wildcat near Port Harcourt. It climaxes long and expensive exploration program. P. 80.

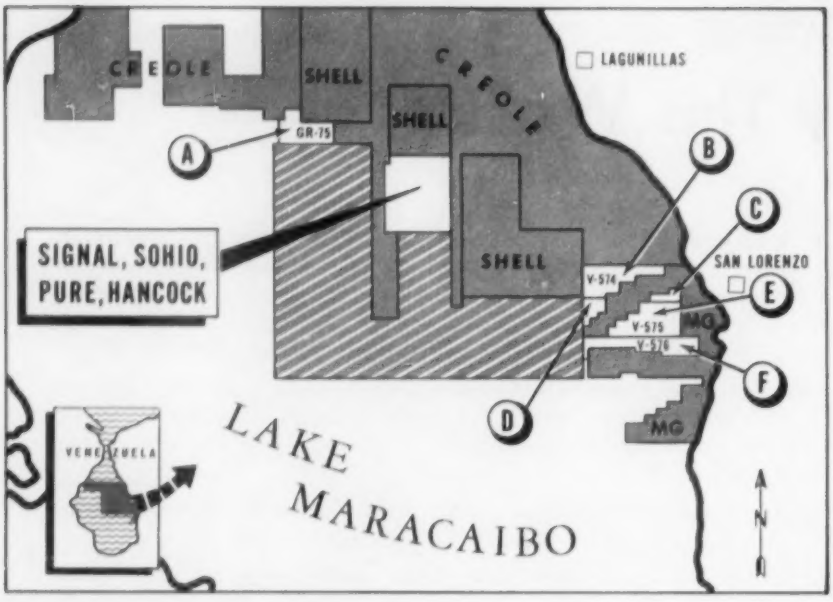
The Venezuelan Government has received $360 million in bonuses from the first sale of new concessions since 1945. Six national-reserve tracts just awarded brought up to $2,625 per acre and concession winners plan to start drilling by spring. P. 62.

Biggest draw works ever built has been installed on mobile drilling platform for work to 20,000-ft. depths in gulf. P. 74.

Production

• **Colorado's authority to limit production** in Adena field is being challenged. One producer is asking for court injunction against conservation order. P. 72.

Arctic oil operations are picking up after 11-year lapse. Imperial has resumed drilling in Norman Wells field, most northerly oil area in hemisphere. P. 77.



Who Won the Latest Tracts

A—Superior $20,405,000
B—Shell $25,968,000
C—Venezuelan American $1,791,000
D—Venezuelan Leaseholds $3,586,000
E—Mene Grande $18,482,000
F—Mene Grande $8,607,000

Solid gray area covers old exploitation concessions.

Lined area includes 10 tracts offered earlier (see story).

Early Drilling Due on Venezuelan Tracts

VENEZUELAN concession winners, just revealed in the Official Gazette in Caracas, are moving fast to exploit the expensive Lake Maracaibo tracts for which they paid up to $2,625 per acre.

Drilling plans had already crystallized on at least two national-reserve tracts by the time the government officially awarded the concessions. Mene Grande Oil Co. (Gulf) let drilling contracts for two national-reserve blocks on the east side of the lake adjoining its own production. The blocks were among six advertised publicly July 4.

Successful bidders in this sale, the government's second since 1945, were announced formally 6 weeks later. And drilling is sure to proceed on them as soon as equipment becomes available.

Seismic exploration is already under way on a 28,000-acre tract which went to a Signal-Pure-Sohio-Hancock combine (see map). It was one of 11 offered by the government a month earlier kicking off what companies expect to be a series of sales opening vast new acreage to exploration.

Drilling preparations . . . The top bidders are wasting no time in starting exploration. They are eager to find out what they got for the fabulous bonuses.

A water crew has been put to work shooting the concession won by subsidiaries of Signal Oil & Gas Co., Pure Oil Co., Standard Oil Co. (Ohio), and Hancock Oil Co. They paid a reported $28-$30 million for Block 4, bounded on three sides by Shell and Creole production *(The Oil and Gas Journal, July 2, page 77)*. It was the highest sum paid for any tract offered in the first sale.

Loffland Brothers Co. of Venezuela has a contract to drill the first well for the combine. It will be spudded as soon as a Loffland tender is completed, perhaps in March. The well will be drilled from a concrete platform. Contract negotiations for the structure are in progress.

Two other tenders are on order and will be placed in service for Mene Grande, which is understood to have made two good strikes in the area recently.

Top bidders . . . Bonuses for the national reserves, covering 43,000 acres, were almost double those reportedly paid for the 11 lake tracts sold in June. They offset some of the Western Hemisphere's most prolific fields and netted the government almost $79 million. The government will also get the usual one-sixth royalty except in the case of one company which offered to pay one-fifth.

Once again Mene Grande, the third-ranking member of Venezuela's Big Three, won the biggest share of the acreage. Creole Petroleum Corp., the country's leading producer, was shut out.

Mene Grande made the high bid on four of the first 11 lake blocks offered and also got two of the national reserves. But the highest per-acre bid for any of the exploitation concessions was $2,625 submitted by Superior Oil Co.

Here are the successful bidders, their acreage, and offers:

. . . **Superior** paid 21,621 bolivars per hectare for 3,146 hectares comprising Group 75 lying just south of Creole and Shell production.

. . . **Cia. Shell** de Venezuela, the second-ranking producer, paid 21,000 bolivars per hectare for 4,122 hectares in the northwest corner of Lot V-574. The block offsets good production recently developed on the acreage which Shell has held for years.

. . . **Mene Grande** paid 14,000 bolivars per hectare for 4,329 hectares in the central section of Lot V-575 and 7,100 bolivars for 4,041 hectares in the northwest section of Lot V-576 (total $27,000,000). Like Shell, it bid highest in the area it knew best. The national reserves, given up to the government when the adjoining concession was converted to exploitation, offset Mene Grande's own production.

. . . **Venezuelan American** Independent Oil Producers Association, Inc., a new company, paid 7,100 bolivars per hectare for an 841-hectare tract in the central section of Lot V-574. The independent combine also bid a royalty of 20 per cent.

. . . **Venezuelan Leaseholds,** C. A., a Venezuelan and American group, paid 15,000 bolivars for adjacent tracts of 670 and 126 hectares in northwestern Lot V-575.

Bids start high . . . Venezuela had set the stage perfectly to reap a bonanza.

It had not opened up any new areas

for 11 years. During that interval there was a sharp increase in the number of U. S. independents and majors desiring to develop foreign production as prime exploration prospects dwindled at home. Western Hemisphere oil had become more attractive than ever.

Being closer to home, Venezuela was a logical spot for U. S. operators who were neophytes in international operations. Newcomers wanted in badly. Established operators wanted to expand. The flush production—2,349,000 bbl. daily — of the world's second largest producer and its leading exporter also lured outsiders into the oil business.

And Venezuela, which depends on oil income for 80 per cent of its $800,000,000 national budget, dangled its most enticing bait before bidders: the acreage located in the vicinity of fields accounting for about half the nation's output.

It was in this setting that companies were induced to pay bonuses totaling $360,000,000 for 314,800 acres. Venezuela got the cash it wanted and will benefit as well from a broadened production base and increased output when development gets under way.

A floor of $485.70 per acre was fixed for the first sale and $600 per acre for the second which opened the national reserves. But even these high prices were dwarfed by actual bids. The national reserves drew bonuses averaging more than three times the government-imposed minimum.

Concessions a tonic . . . Impact of the new grants is already being felt in American shipyards which will build tenders to serve the offshore rigs.

The stimulant will spread to seismic contractors, service companies, and suppliers of all kinds by the time activity begins to pick up in earnest around mid-1957.

Drilling contractors believe that rigs now operating will be sufficient to handle increased drilling in the near future.

Seismograph contractors, confined mostly to land, are interested in expanding both on land and on water. Most are not equipped to operate on water, however.

Supply companies are making plans to handle increased business. There is the prospect that the new concessions, besides increasing volume, might change the buying pattern as well.

The big operators in Venezuela have bought much of their equipment in the states. But suppliers don't expect the newcomers, which include small independents, to carry their own stocks. They will have to buy locally.

Halliburton Oil Well Cementing Co. has two cementing boats in Venezuela and one permanent completion barge. Another boat is budgeted. Expanded operations are being considered in budget planning now in progress.

Dowell Incorporated has opened a new station on the east side of the lake. The company has moved four more families to Venezuela, and recently added two big high-pressure units for formation fracturing.

Steel bottleneck . . . All concession holders want to start drilling as soon as possible. But they have run into an important bottleneck—the shortage of steel.

Plates and structurals were tight before the July strike. Now customers will have to get in line and wait their turn for steel to become available to build vessels needed for the marine drilling operations in water up to 90 ft. deep.

There is competition for steel also from U. S. offshore operators whose demand for drilling barges and platforms is high because of the push to validate expiring leases.

Signal gets head start . . . By moving fast, the Signal-Pure-Sohio group will not have to worry so much about the steel shortage.

Signal Exploration Co. is operator for the companies.

Garth L. Young, Signal vice president, will run the operation as general manager. R. B. Kelly, vice president for exploration and production for Pure, is chairman of the operating committee.

Ches M. Harden, general manager of Pure's Rocky Mountain producing division for 10 years, is superintendent of drilling and production in Venezuela. G. R. Olsen, senior production engineer for Pure in Chicago, with experience in U. S. offshore operations, will be senior production engineer.

A Venezuelan subsidiary including the four firms will be registered later.

The group, completely new to Venezuela, pushed ahead after being notified of its award by the government, although the government has not announced the grant publicly. The government late last week had said nothing concerning the other 10 concessions in the same group either. And there was no further word from the companies themselves.

However, the Journal learned from unofficial sources in Venezuela 6 weeks ago that other blocks went to Mene Grande, Creole, Shell, Sun Oil Co., and Atlantic Refining Co. *(The Oil and Gas Journal, July 2, page 77).*

The national-reserve sale has been handled in a different manner. The tracts were advertised and successful bidders published in the Official Gazette, as required by law. After preliminary offers were made on the other lake acreage, certain companies were invited to make final bids to determine the winner. These awards are still officially hanging fire.

Surprise grant . . . The Signal-Pure-Hancock-Sohio group disclosed it has received a 100,000-acre tract on the Peninsula of Goagira in the remote section near the Colombian border.

This is the second such concession near the Colombian border reported in connection with firms which won lake tracts. These tracts are for exploration, as opposed to the exploitation concessions in Lake Maracaibo. And no plans have been announced for exploring them.

But activity elsewhere is due to step up. Companies feel the lake leasings were only the beginning.

What's to come . . . Those sales only whetted their appetites.

Thirty-two other lake tracts have been blocked out for possible offering. Shell and Venezuelan American have just filed application for several other concessions on the lake, according to the Official Gazette.

Dozens of companies, outbid in the lake or ruled out from the beginning by the stiff ante, are eagerly awaiting the expected opening of other areas. Applications to explore prospective concession areas cover more than 68 million acres.

Mara field, on the west side of the Gulf of Venezuela, is a hot prospect. Unofficial reports have already given a tract there to an American independent group. But there is no confirmation from the government. And one of the Big Three operators is known to be competing for the concession.

Also of prime interest in Western Venezuela is the State of Barinas, southeast of Lake Maracaibo, scene of a discovery by Venezuelan Petroleum Co. (Sinclair) 3 years ago. The company is still drilling to evaluate the strike, which came in for 1,300 bbl. daily. Estimates place probable recovery of the new field at 66 million barrels. Acreage bordering the Sinclair concession is among the most coveted in the country.

In Eastern Venezuela, another Sinclair discovery is a focal point of exploratory interest. Its deep strike northeast of Greater Oficina field in the State of Monagas had initial potential of around 1,800 bbl. daily.

Many companies which were not interested in the lake are waiting for a chance to bid in Eastern Venezuela generally—both for choice national reserves and rank wildcat territory.

Tidelands in Court . . .

WASHINGTON. — Atty. Gen. Herbert Brownell asked the Supreme Court last week to deny Louisiana's motion to dismiss the Government's tidelands suit.

Brownell told the court there is no merit in the state's claim that the federal Government cannot sue it without its consent and that the boundary issue is a political question on which only Congress can act.

There was no direct connection between the department's action and the effort to reach a federal-state agreement under which developments in the "twilight zone" can continue until the boundary issue is settled.

Louisiana filed its motion June 22. The department's answer was filed at the end of the 60-day period in which to reply.

Brownell noted in his brief that, although Louisiana was given 90 days in which to reply to the Government's complaint instead of the usual 30 days, it has not yet filed its answer, submitting the motion to dismiss instead.

Nine-time loser . . . The department's brief pointed out that the claim the federal Government cannot sue a state without the latter's consent was raised nine times by Louisiana during the course of the original tidelands suit, filed in 1948. In each instance, Brownell said, the court overruled the state.

"Having failed to prevail on that issue in earlier litigation with the United States, Louisiana should be estopped to raise the point now," Brownell declared.

Where's the boundary? . . . Brownell also maintained that the suit does not call for the court to make a policy decision on the state's seaward boundary.

All it asks, he said, is a decision as to where the boundary has been set by Congress and a settlement of the rights of the U. S. and the state.

Congress did not delegate its legislative powers in leaving the court to deal with disputes over state boundaries, Brownell said. The settlement of disputes as to the results of past actions, political or otherwise, is a judicial and not a legislative function, he declared.

The Supreme Court opens its 1956-57 term October 1 and a week later will announce the cases that will be taken up. The tidelands issue may be included.

If the court accepts the case, both sides will be given time in which to file briefs. But court attaches do not believe arguments can be held before mid-November at the earliest.

. . . And in Conferences

BATON ROUGE.—A three-man committee of lawyers is trying to work out a "package deal" as a basis for settling the tidelands controversy between Louisiana and the federal Government.

The committee was named by W. G. Helis, Jr., chairman of the Louisiana Mineral Board. It consists of Morris Wright, New Orleans, and Scott Wilkinson, Shreveport, both representing Louisiana, and Austin Lewis, Lake Charles, who is representing a group of offshore oil operators.

In preliminary sessions last week, the group started drafting a set of proposals to be submitted to the U. S. Department of Interior.

It was another step in the conference approach to a solution which would permit new drilling starts in the disputed area. Drilling already under way when the Supreme Court imposed its drilling ban 2 months ago may be continued.

The injunction, covering the entire sector of the tidelands where federal and state claims overlap, can be lifted only by order of the court or by mutual agreement of the disputing agencies.

Proposals revealed . . . Meanwhile, Helis revealed the latest proposals offered by the federal agency.

He said the Interior Department has suggested that rentals and royalties from leases in the disputed zone be impounded pending a settlement.

The proposal also would ban new leasing between 3 and 10 miles from shore and would impose a 1-year delay in leasing as far out as the state has claimed jurisdiction, which in some areas is more than 35 miles.

The federal proposals made it clear that Louisiana's jurisdiction would be recognized out to the 3-mile line.

Since the area within 3 miles of shore is not involved in the current dispute, the federal proposal implies that the Interior Department would insist on control beyond that line. The state is not willing to concede on this issue.

Interior Solicitor J. Reuel Armstrong denied a report that the federal Government has agreed to drop its insistence on controlling all new leasing within the area of conflict.

He said Interior has forwarded changes to its original agreement plan to state officials and "the next move is up to them." The changes were proposed by a 19-man committee in a conference with Armstrong earlier this month *(The Oil and Gas Journal, August 13, page 80)*.

"The federal proposal, as presented, goes a long way toward solving the controversy," said one oil man.

Pessimism prevails . . . However, most operators are pessimistic about the prospects for an early settlement.

Some contend privately that both Louisiana and the Interior Department are much more interested in fighting their lawsuit than in reaching a truce under which drilling might be resumed.

Both government agencies "feel like they can use the companies as a whip," complained one operator.

Severity of the squabble was emphasized last week with the announcement that Anderson-Prichard Oil Corp. had been required to pay annual rental of $6,612.44 for a 1,250-acre lease on which it is forbidden to drill.

The company also has an expensive platform erected and total interests in about 14,000 acres—all in the disputed area. It paid the rentals under protest after being refused the necessary permit to hold the lease by drilling.

Apco strikes out . . . Anderson-Prichard went clear to the Supreme Court in its attempt to reach a compromise with federal and state officials. A victory would have been an important precedent for other drillers in the disputed area. Here's what the company did:

It signed a stipulation with the Louisiana Minerals Board permitting it to drill. All rents and royalties would have been impounded pending settlement of the boundary question. However, the Interior Department refused to sign the stipulation.

The company then went before Supreme Court Justice Hugo Black with an appeal for relief from special hardships imposed by Interior's refusal to sign the compromise agreement.

The original Supreme Court injunction freezing tidelands operations had permitted drilling to be resumed if agreement was reached with both parties concerned. However, Justice Black denied Anderson-Prichard's appeal.

Solicitor Armstrong explained later that the Interior Department is considering the advisability of extending lease terms as long as the drilling ban is in effect. However, he said the department does not propose to cancel annual rentals.

SHINY NEW UNITS for making high-octane gas put . . .

Champlin Back in the Running

ENID, Okla.—The 342 men who run the Enid works of Champlin Refining Co. are a proud outfit these days.

From process engineer to the unskilled yard man, they like the new plant that has risen here in the last 2 years, replacing the small out-dated refinery that existed before.

"It's like moving from the minors to the big league," one worker said in describing the remarkable changes. And that's practically what Champlin has achieved on wheat fields near here.

What happened . . . Changes got under way quickly after the Chicago Corp., previously an oil-producing concern, bought out Champlin. Aim of the new owner was an integrated operation in producing, refining, pipelining, and marketing.

At the time of the sale more than 2 years ago, Champlin refinery was small —capacity 17,000 bbl. daily. Many of its units were obsolete by modern standards. Quality products could be refined only through purchase of blending stocks, a costly way to stay in the high-octane race.

Chicago officials decided on a major overhaul. They set up a budget of $4.5 to $5 million to do the job. Their aim: To meet competition head on with the finest petroleum products available without having to buy blending stocks from other refiners.

The result . . . The goal was achieved in a comparatively short period of time. Last of the new units just went on stream recently giving the refinery a crude throughput of 31,000 bbl. daily.

Big new process units in shiny paint now dominate the plant site, towering over the few older units which were retained and integrated into the plant. Here's what Champlin added:

. . . A 9,000-bbl. daily fluid catalytic cracker and gas-recovery unit. It is a Model B Orthoflow unit.

. . . A 5,000-bbl. Platformer for upgrading naphtha to high-octane gasoline-blending stock.

. . . A new polymerization unit for producing high-octane gasoline.

. . . A stabilizer for controlling vapor pressure of straight-run primary gasoline coming off the crude unit.

. . . Another 8,000-bbl. crude unit for more efficient recovery of gas-oil charge for the cat cracker.

. . . New refinery offices and laboratory facilities.

Work on the last unit was completed in April and the plant is now settling down to routine operations.

L. A. Whitney, vice president for manufacturing, reported the plant has hit peak efficiency quickly, and already is turning out more than 30,000 bbl. daily of products.

In addition to the work at the Enid plant, the Chicago Corp. also added a 50-mile, 15,000-bbl. products line from Enid to Ponca City and a 70-mile products line from Enid to Oklahoma City. These supplement a 516-mile, 6-in. products line already operating from Enid to Rock Rapids, Iowa.

Refining BRIEFS

SARNIA, Ont.—Canadian Oil Refineries, Ltd., has awarded to Fluor Corp. of Canada, Ltd., a contract to engineer and erect a 4,400-bbl. Platformer and a 3,600-bbl. Udex unit here.

The $3,000,000 project will be started this fall, with completion scheduled for early next summer. Fluor recently completed an expansion of the company's lube-oil and grease plant at Montreal.

LONGVIEW, Tex.—Premier Oil Refining Co. has broken ground for a $1,250,000 expansion of its 4,500 bbl. refinery here. New units will include a 2,000 bbl. Platforming unit and a 1,500 bbl. Unifining unit *(The Oil and Gas Journal, July 30, page 125).*

Premier also plans to replace the present single coils in its 2,200 bbl. thermal cracker with a high-pressure double coil. Contract for the major revamp of the cracker has been let to Early Co., Shreveport. Contracts for construction of the Platformer and Unifiner will be let within the next 2 weeks. All needed equipment and materials have been ordered.

LUDINGTON, Mich.—A $2-million plant addition to produce a catalyst used in making synthetic rubber will be built here by Dow Chemical Co. The plant will be in operation by the end of 1957. The catalyst is used in preparation of butadiene and has been produced in smaller amounts at Dow's Midland, Mich., facilities since 1945.

NEW YORK.—Tidewater Oil Co. is moving for the first time into Virginia markets. Looking to the day late this year when the new 130,000-bbl. refinery will be on stream at Delaware City, the company has been extending and intensifying its marketing setup all along the East Coast.

BIG SPRING, Tex.—Cosden Petroleum Corp. has converted its existing Platformer here to operate entirely on preparation of aromatic feed stock for production of benzene, toluene, and xylenes in the integrated Udex unit.

The Platformer has been producing gasoline blending material, as well as some aromatic feedstock for the Udex unit. The conversion is tied in with the recent completion of the company's new Rexformer *(The Oil and Gas Journal, August 6, page 67).* A feature of the new Rexformer is a prefractionation section which will handle straight-run gasoline derived from natural gasoline and miscellaneous pentane and butane fractions.

Imports in 1956 to Jump 17-20 Per Cent

CRUDE imports into the United States this year will show an increase of between 17 and 20 per cent over the average for 1955 if present trends continue.

That is the picture revealed by latest company reports to the Texas Railroad Commission. The companies reported their actual imports through July and for the first time estimated their imports for the remaining months of the year.

(Individual company import statistics are shown in the table. The last two columns give figures for comparing 1956 estimates with 1955).

Total imports will average 934,000 bbl. daily for the year if the actual crude movements follow company estimates. The average for 1955 was 754,200 bbl. daily, according to Texas Railroad Commission reports.

Differences . . . However, the annual totals for 1956 and 1955 are not exactly comparable.

The commission in April this year added more importers to its list of reporting companies. These new firms report planned imports of crude for the year amounting to 46,300 bbl. daily.

If this is deducted from the entire 1956 total, the remaining 887,900 bbl. daily represents total 1956 crude imports by the companies reporting both in 1955 and 1956. Comparing this total with the 754,200 bbl. daily average in 1955 shows a gain of 133,900 bbl. daily or 17.8 per cent.

But the statistics also show that the new reporting companies are bringing in more crude than last year. They are averaging 46,300 bbl. daily. Last year the total of all crude imports not reported to the commission amounted to only 27,800 bbl. daily. This would indicate a gain for the new-reporting companies is at least 18,500 bbl. daily or 66 per cent.

Thus the commission's new crude import total of 934,000 bbl. daily is 152,000 bbl. daily or 19.5 per cent higher than all crude imports reported by the Bureau of Mines for 1955. This means that companies reporting for both years show a planned increase of 17.8 per cent, but the over-all crude total will be up at least 19.5 per cent.

Last half spurt . . . Crude imports will average more than 1,000,000 bbl. daily for each month of the last half of the year. Commission reports show a peak in October of 1,025,700 bbl. daily.

Product imports will climb to 545,000 bbl. daily in December under the influence of winter demand for fuels. Thus with only small monthly changes in crude imports during the last half and sharp seasonal increases in receipts of products, total imports for December will reach an all-time high.

For the month of December 1955, actual product imports averaged 8.4 per cent more than the total reported to the Texas Railroad Commission. If this same ratio holds this year, actual product imports will average 590,000 bbl. daily in December. This product total and the 1,019,000 bbl. daily of crude in December will add to more

A Look at Imports 'til the End of 1956

(Thousands of barrels daily)

	July* 1956	Aug. 1956	Sept. 1956	Oct. 1956	Nov. 1956	Dec. 1956	Year 1956	Year 1955
		Estimated or forecast*						
Crude—East Coast								
Atlantic Refining Co.	70.2	71.0	71.0	71.0	71.0	71.0	68.9	64.1
Cities Service Co.	§36.3	29.6	26.3	31.6	31.7	31.6	27.3	29.4
Eastern States Petroleum Co.	17.0	40.0	15.0	22.5	22.5	22.5	20.5	17.2
Gabriel Oil Co.	6.3	6.5	6.7	6.5	6.7	6.5	6.6	(††)
Gulf Oil Corp.	149.0	141.0	125.0	144.0	144.0	144.0	134.8	125.0
Hancock Oil Co.	1.7	1.9	2.0	1.9	2.0	1.9	1.7	(††)
Lake Superior Refining Co.	5.5	3.2	5.3	5.2	5.3	5.2	5.1	(††)
Phillips Petroleum Co.	9.8	11.6	12.0	11.6	12.0	11.6	10.0	10.6
San Jacinto Petroleum Corp.	1.6	2.0	2.0	2.0	2.0	2.0	1.6	(††)
Signal Oil & Gas Co.	1.6	1.5	1.5	1.5	1.5	1.5	1.4	(††)
Sinclair Oil Corp.	86.4	67.7	74.7	77.5	66.4	72.4	73.3	68.9
Shell Oil Co.	1.0	0.5	1.8	5.0	5.0	5.0	2.1	0.5
Socony Mobil Oil Co., Inc.	69.2	69.5	72.5	72.5	72.5	72.5	68.5	71.4
Sohio Petroleum Co.	1.2	3.4	3.5	3.4	3.5	3.4	2.1	0.7
Southwestern Oil & Refining Co.		3.6	3.8	3.6	3.8	3.6	2.7	5.6
Standard Oil Co. of Calif.	85.1	76.0	76.0	76.0	76.0	76.0	77.9	76.6
Standard Oil Co. (Ind.)‡	17.5	20.6	21.2	24.6	21.3	13.1	17.2	15.0
Standard Oil Co. (N. J.)†	89.0	83.0	83.0	76.0	76.0	76.0	79.7	79.3
Sun Oil Co.	55.7	45.5	66.5	58.1	58.5	58.2	45.8	24.3
The Texas Co.	88.3	67.2	64.0	57.1	77.6	80.2	69.3	65.1
Tidewater Oil Co.	26.0	27.8	33.7	22.0	49.3	42.9	24.3	13.1
Total East Coast	818.4	773.1	767.4	773.6	808.6	801.1	740.8	‡‡669.1
Crude—West Coast								
Douglas Oil Co. of Calif.		4.0	4.2				1.0	(††)
Shell Oil Co.	3.9	52.7	52.0	56.4	46.7	56.4	32.0	6.7
Socony Mobil Oil Co., Inc.	27.7	26.6	37.6	37.3	37.3	37.3	34.4	26.4
Standard Oil Co. of Calif.	27.3	43.6	43.6	43.6	43.6	43.6	27.8	17.7
The Texas Co.	45.9	17.3	26.5	35.8	21.3	23.6	24.6	9.5
Tidewater Oil Co.	47.3	50.9	59.9	52.3	33.5	30.7	44.7	24.8
Union Oil Co. of Calif.	14.7	10.0	10.0	10.0	10.0	10.0	11.0	(††)
Wilshire Oil Co.	24.0	26.6	17.1	16.7	16.6	16.6	17.9	(††)
Total West Coast	190.8	231.7	250.9	252.1	209.0	218.2	193.4	85.1
Total crude	1,009.2	1,004.8	1,018.3	1,025.7	1,017.6	1,019.3	934.2	754.2
Products								
Asiatic Petroleum Corp.	2.8	9.8	4.5	6.9	4.8	4.4	5.1	5.7
Eastern States Petroleum Co.	11.4	10.0	10.0	10.0	10.0	10.0	11.1	17.8
Gabriel Oil Co.	0.5	1.0	1.0	1.0	1.0	1.0	0.9	(††)
Gulf Oil Corp.	12.0	5.0	7.0	7.0	7.0	7.0	5.7	6.7
Shell Caribbean Petroleum Co.¶	69.0	90.0	83.0	94.0	143.0	184.0	128.8	117.3
Shell Oil Co.	21.7	17.1	19.5	23.3	22.4	25.1	21.8	22.2
Sinclair Oil Corp.							0.8	1.7
Socony Mobil Oil Co., Inc.	10.6	12.5	12.5	12.5	12.5	12.5	9.4	8.9
Standard Oil Co. of Calif.	6.0	6.3	6.3	6.3	6.3	6.3	3.1	
Standard Oil Co. (Ind.)‡	18.6	19.9	26.3	29.5	31.9	38.7	28.0	21.5
Standard Oil Co. (N. J.)†**	114.0	150.0	150.0	252.0	252.0	252.0	183.5	172.7
The Texas Co.	4.3		8.6		4.2	4.0	2.1	
Total products	270.9	321.6	328.7	442.5	495.1	545.0	400.3	§§374.8
Total crude and products	1,280.2	1,326.4	1,347.0	1,468.2	1,512.7	1,564.3	1,334.5	1,129.0
Bonded fuel included‖	89.0	102.8	100.5	104.1	101.3	101.6	88.2	71.6

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Received through suppliers who can furnish either domestic or foreign oil. §Includes 8,141 bbl. daily of June cargo delayed in transit. ¶Imported by independent distributors. ‖Mostly duty free for bunkering ships in foreign trade. **Includes bonded drawback for foreign flag international bunkers as follows: July, 49,000 bbl. daily; third quarter, 52,000 bbl. daily; and fourth quarter, 53,000 bbl. daily. ††Did not report to the commission last year. ‡‡Includes 2,300 bbl. daily by McBride Oil & Gas Corp. §§Includes 300 bbl. daily by Cities Service Co.

than 1,600,000 bbl. daily for all imports.

Steady trend . . . The latest reports to the commission indicate that there has been very little change in plans for crude imports since July.

Company reports in July showed a planned average of 981,000 bbl. daily of imported crude for the July-November period. The August reports show an average of 1,016,000 bbl. daily for the same period. But most of the difference represents crude for Shell's Washington refinery which could not be scheduled last month because of the refinery strike.

If total imports follow the plans reported to the commission, the average for the year will set a new record, and the volumetric increase over 1955 will be almost as large as the 197,000 bbl. daily gain from 1954 to 1955.

Plant Modernizing

Program is second in year for refinery at Williston

WILLISTON, N. D.—The second extensive revamping program in less than a year is nearing completion at Westland Oil Co.'s one-time bankrupt refinery here.

Major installations involved in the current modernization program are a 1,200-bbl. thermal cracking unit and a 530-bbl. Platformer. The Platforming unit, which will reform naphtha into high-octane blending materials, will replace a 175-bbl. unit.

Westland purchased the refinery late last year for $150,000 and immediately launched a $70,000 overhaul program (*The Oil and Gas Journal, November 28, 1955, page 65*). Included was a boost in storage capacity from 40,000 bbl. to 90,000 bbl. The current program will bring Westland's investment in the plant to about $850,000.

The plant, operated by Williston Basin Refinery Corp. until shut down by creditors, has recently been running at the maximum output of 1,500 bbl. daily. Westland trucks its crude in from North Dakota and eastern Montana.

Products are distributed through about 20 jobber accounts and Westland's 29 bulk plants in the two states. With headquarters in Minot, N. D., the firm operates 36 service stations in Montana and North Dakota.

R. J. Coughlin is president of Westland, which was started at Scobey, Mont., in 1919. Jack Coughlin is executive vice president. R. J. Coughlin, Jr., is manager of the Williston plant and Tom Moore is superintendent.

watching WASHINGTON

. . . with **Bertram F. Linz**

Something is missing . . .

OIL may become a leading issue in the forthcoming presidential campaign. But the Democratic Party has not formally set it up as a target, and the Republicans will not.

Oil was mentioned in the platforms of both parties. But the Democratic platform did not, as was expected in some quarters, single it out for attack. It did call for development of all natural resources "for all of the people." It did charge the Eisenhower administration "has despoiled future generations of their heritage." But neither the leasing of wildlife refuges and offshore lands nor the Harris gas bill was mentioned.

The nearest the Democrats got to oil directly was to promise continued research on synthetic liquid fuel from coal, shale, and agricultural products.

Half a continent away, Republican policymakers last week wrote a natural resources development program as one of their planks supporting a freely competitive economy.

Oil money busy abroad . . .

AMERICAN oil-company investments abroad probably exceed $6 billion today.

A Commerce Department study places the investment in foreign branches and subsidiaries at $5.8 billion at the end of last year. Total American investments abroad at that time ran to $29 billion, an increase of $2.4 billion during last year. Oil accounted for one-fifth of all U. S. money poured into foreign operations.

The department's survey showed that oil money is being put to work in practically every area of the world where there are prospects of petroleum. Significant in last year's activities were the investments in Canada, running ahead of 1954, and the nearly $100 million put into the oil industry in Europe, where the development of fuel resources is particularly important.

The big investments in oil and manufacturing (which ran to $6.3 billion last year) have sparked a new drive in foreign operations. Early information for 1956 indicates that new large investments are being made.

No celebration for automation . . .

AUTOMATION will be the big subject at next year's session of the International Labor Organization.

Introduced here in the oil and other industries with no resistance by labor, workers abroad are less receptive to the idea that machines can replace muscle without creating unemployment.

A number of foreign governments have indicated concern over the growing spread of production by robots. They realize the change is inevitable. But foreign economies are not geared to American mass production methods. For a time, automation could create uncertainty in employment. What they want is a formula that will reassure workers that they are still needed—that automation will make for better standards of living by calling for new skills.

The United Nations' labor agency will explore the problem next year. There are indications the I.L.O. may split into two camps. The more conservative countries, which have been experiencing unemployment problems since the end of the war, probably will want to pace automation to the ability of displaced workers to get new jobs.

But the communist countries already have indicated they see automation as the answer to their problem, which is a lack rather than an excess of skilled labor. The Polish delegate to the 1955 I.L.O. meeting forecast that the shortage will probably continue. Automation, he said, will enable Polish industry to play a bigger part in international trade.

1. Big-inch line pipe is . . .

2. Carefully aligned and welded into place . . .

T.G.T. Throws A Big Loop Into Its

5. Strings next are snaked into place . . .

6. For the final lowering-in operation . . .

3. Then pipe is cleaned and primed . . .

4. And gets a coating and wrapping . . .

Big-Inch Gas Line

CATLETTSBURG, Ky.—Construction is nearly completed on a 216-mile addition to the Tennessee Gas Transmission Co. pipeline system in Kentucky and Ohio.

The project will include 74 miles of 30-in. loop and 142 miles of 26-in. Both are being laid parallel to existing lines on the natural-gas transmission company's main system. It is part of a $56,000,000 expansion program which will boost the company's average daily delivery capacity by 70,000,000 cu. ft.

The 74-mile segment of 30-in. pipe from a point near Danville, Ky., to a point near Cave City, Ky., is being laid by Bechtel Corp. In Ohio, H. C. Price Co. has contract for laying 81 miles of 26-in. pipe from just north of the Ohio River to near McConnelsville. Remaining 61 miles of 26-in. line, contracted to Oklahoma Construction Co., will extend from near Newcomerstown to near Lisbon, Ohio.

The current Tennessee Gas expansion program also includes construction of new compressor stations near Winnsboro, La., and New Albany, Miss., and addition of horsepower at existing compressor stations near Isola, Miss., and Campbellsville, Winchester, and Catlettsburg, Ky.

Already completed this summer is the "Muskrat Line," a 355-mile extension of T.G.T.'s natural-gas gathering system into Southeast Louisiana.

The current looping program is due to be completed early this fall. Combined with expansion recently finished, it will increase T.G.T.'s average daily delivery capacity from 1,730,000 M.c.f. of gas to 1,800,000 M.c.f. The system's peak-day capacity will be boosted to 2,180,000 M.c.f.

Pipe can climb a steep hill, too.

U.O.P. Fight Grows

Robineau appeals to Justice Department to halt sale of trust; action is one of several aimed at this objective

WASHINGTON. — The Justice Department was asked last week to halt the proposed sale of Universal Oil Products Co. stock, held in trust for the American Chemical Society.

The sale, planned by the Guaranty Trust Co., could put U.O.P. in the hands of "adverse" interests and further weaken independent refiners, M. H. Robineau, president of the Independent Refiners Association of America and Frontier Refining Co., declared in a letter to Asst. Atty. Gen. Victor E. Hansen, head of the antitrust division.

Guaranty Trust is trustee for the Petroleum Research Fund, which holds the U.O.P. stock. Profits from U.O.P. go to the American Chemical Society for petroleum-industry research. Guaranty Trust asked the New York Supreme Court last May for permission to sell the stock *(The Oil and Gas Journal, July 2, page 64)*.

The research and development facilities of U.O.P. "are absolutely essential to the independent refiners in order for them to compete effectively" Robineau said in releasing his letter to Hansen. Sale of the stock could easily result in "an ultimate substantial lessening of competition," he added.

Maneuvering hit . . . Robineau hinted that "maneuverings" in connection with the proposed sale would bear investigation. There is real need to get all pertinent facts before the public, he asserted.

Independent refiners have a vital stake in vigorous enforcement of the antitrust laws, Robineau wrote Hansen. As small businessmen, he said, they are faced with serious marketing and financing difficulties.

"More important, however," he continued, "independents, in their competition with the majors, suffer from a serious—perhaps in the years immediately ahead a crippling—disadvantage relatively unique to the oil business.

"Since they cannot finance for themselves the research and development activities presently and prospectively so vital to survival in petroleum, they are extremely sensitive to any changes which may affect their access to the technology provided by others.

"The pending New York proceeding threatens them with the grave danger of losing the only substantial independent source of technology presently available to them."

The stock was turned over to the American Chemical Society in trust in 1944, under an agreement that the company would be operated in the public welfare.

Guaranty Trust's request for permission to sell the stock did not name a proposed buyer. It was reported, however, that several chemical companies were interested in acquiring U.O.P.

The only company mentioned publicly in this connection is Filtrol Corp. of Los Angeles. The firm has asked the New York Supreme Court to set forth a formal bidding procedure, based on suggestions it submitted along with the proposal *(The Oil and Gas Journal, August 6, page 53)*.

Other opposition . . . More recently, Filtrol, petitioned the court to take the sale out of the hands of Guaranty Trust, declaring that the U.O.P. trustee was "playing favorites" by extending exclusive information to a banking firm *(The Oil and Gas Journal, August 20, page 112)*.

The proposed sale has hit other snags. New York's attorney general, Jacob K. Javits, has objected that the 10 per cent commission asked by Guaranty Trust is excessive. And several small refiners and the I.R.A.A. have filed motions to intervene.

Petitions by Aurora Gasoline Co., Frontier Refining Co., and the I.R.A.A. came before the court August 17, but action was deferred. Similar applications aimed at blocking the sale have been filed by Ingram Oil & Refining Co. and Eastern States Petroleum Co.

AFTER 18 YEARS, officials turn the valve on commercial production as . . .

First Gas Flows From Big Piney

BIG PINEY, Wyo.—First commercial production of gas from the long-neglected Big Piney field in Wyoming marks a new era of industrialization for the Northwest.

Industry and government officials joined in turning the valve to initiate the flow of some 750 million cubic feet of gas reserves into the Pacific Northwest Pipeline Corp.'s transmission system.

The field was discovered in 1938. Because of the lack of a gas outlet, little development drilling was done until 1952 when Pacific Northwest began discussing plans for a pipeline to Oregon and Washington *(The Oil and Gas Journal, August 13, page 97)*.

Shown opening the valve to start the flow of gas are, left to right, P. S. Magruder, executive vice president of General Petroleum Corp.; C. R. Williams, vice chairman of the board of Pacific Northwest; Gov. Milward Simpson of Wyoming; and Arthur B. Belfer of New York and David C. Bintliff of Houston, owners of the field.

Sinclair Peps Up Power-X

Superpremium, beefed up with secret additive, to replace old top grade in 37-state marketing area on September 11

HARVEY, Ill.—A new superpremium gasoline will make its bow September 11 in Sinclair Refining Co.'s 37-state marketing area. The new Power-X grade will boast an additive never before used in gasoline, Sinclair says.

Its announcement last week listed Sinclair among the majors who will not add a third grade but will meet the high-octane market with beefed-up premium grades. Sinclair's new gasoline will sell for 1 cent over the present premium.

Like the others, Sinclair is naming no octane rating, although it is understood to be a boost over the 98-octane fuel it is marketing in some areas. The company is emphasizing its new additive called "X chemical."

This novel additive, says Sinclair, packs a triple punch. It minimizes engine-deposit buildup and accompanying octane-requirement increase. It practically eliminates preignition knock and spark plug fouling. The additive was developed by Sinclair laboratories here. A new plant has been built to make it.

Stiff tests . . . Sinclair arranged with the American Automobile Association to supervise and carry out a testing program on the new gasoline and additive.

The A.A.A. test, said Sinclair, showed the following results:

. . . **A dynamometer-mounted Cadillac** was operated on present Power-X until deposits reached equilibrium, and octane requirement built up to 99. A typical competitive additive then was added to the fuel and the ORI rose to 101. When X-chemical was substituted, the octane requirement dropped to 94, a 35 per cent reduction in ORI.

. . . **Two 1956 Buicks** were road-tested alternately on present Power-X and the new additive fuel. Octane requirements with the additive were 1½ to 2 numbers lower. Without the additive, the cars became preignition-limited in 4,000 to 5,000 miles. But with it, preignition requirements were kept 1 to 3 numbers below antiknock requirements.

The additive also reduced sparkplug fouling, said Sinclair. There were 15 sparkplug failures during operation with present premium and four when using the additive.

In one tankful of the new additive fuel preignition requirements in a 1954 Pontiac dropped from 96 to 94 octane.

What happens . . . According to Sinclair, the new additive reduces preignition and plug fouling by changing the chemical composition of deposits so that they do not glow or conduct electrical current.

But unlike others, Sinclair's additive does not contribute to added deposit buildup and increased antiknock requirements. The new fuel was accepted for use after extensive laboratory and fleet tests.

U.S. Steel Buys Udex Unit

PITTSBURGH.—A second steel company has announced it will adapt oil-refining processes to the production of benzene, toluene, and xylene from coal chemicals.

U. S. Steel Corp. has awarded a contract to Koppers Co., Inc., for construction of two units at Clairton, Pa. One will be a purifications process developed by a German firm and licensed to Koppers. The other will be a Universal Oil Products Udex unit. They should be operating late next year.

Jones & Laughlin Steel Corp. said earlier this month it will build Hydrofining and Udex units at its coal coking plant at Alquippa, Pa., for the same purpose *(The Oil and Gas Journal, August 20, page 99)*.

In both cases, impurities will be extracted from byproduct light oil, which will then be separated into high-purity benzene, toluene, and xylene.

Montana Pipeline Planned

BUTTE, Mont. — Montana Power Co. has awarded a contract for construction of 75 miles of 6-in. natural-gas line from Montana's Big Coulee gas field to the outskirts of Lewistown and Harlowton.

O'Connor Construction Co., Fromberg, Mont., will start work on the project by September 1. Completion of the line is scheduled by December. Cost of the facility has not been announced.

Montana Power said its year-long drilling program in Big Coulee field established commercial quantities of gas to provide a supply for the Lewistown-Harlowton area.

Industry BRIEFS

CHICKASHA, Okla.—Frankfort Oil Co. is reported abandoning its Oklahoma record-depth well in the Chickasha district. Its 1 Pruitt penetrated to 18,158-ft. total depth and plugged back to squeeze zone at 16,175 ft. Gas shows in the Springer at 17,300-82 ft. apparently were not commercial. Previous Oklahoma depth record was Superior Oil Co.'s 17,832-ft. failure in Caddo County.

WILMINGTON, Del.—Stockholders of International Mining Corp. have approved a merger with Sunset Oil Co. into a new firm to be known as Sunset International Petroleum Corp. Sunset stockholders approved the plan previously.

BIG SPRING, Tex.—Cosden Petroleum Corp. has purchased a one-third working interest in the Blanco Oil Co., et al, properties of Jo-Mill field in Borden County, Texas. The transaction was with Newman Brothers Drilling Co. It includes interest in 17 wells with a net production in excess of 10,000 bbl. a month.

SPRINGFIELD, Ill. — The Illinois Commerce Commission has approved plans of Northern Illinois Gas Co. to mine a 238,000-bbl. propane storage cavern near Chicago. Northern Illinois will let contracts soon and expects to have the shale cavern ready to receive L.P.G. next summer.

HINTON, Alta.—A 10-in., 136-mile pipeline being built by North Canada Oil, Ltd., from Wabumun gas field, 40 miles west of Edmonton, is expected to reach its terminus here the first week in September. It will bring gas to a pulp mill nearing completion by North Western Pulp & Paper, Ltd. The line will deliver 7,000,000 cu. ft. daily to the pulp mill under a 20-year contract at 41 cents per M.c.f. It might also serve towns along the route. Patrol-Structors, Ltd., is the contractor.

BALTIMORE. — Cities Service Co. last week launched its third supertanker built under the Maritime Administration's "trade in and build" program. It was the 32,000-ton Cities Service Norfolk, same size as the two other Cities Service products carriers.

All three ships were launched here at the Sparrows Point Shipyards of Bethlehem Steel Co. The others are Cities Service Baltimore and Cities Service Miami. Cargo capacity is 273,175 bbl. Speed is 16½ knots.

Pipe Mills Await Ruling

Fate of steel expansion program depends on decision by Defense Mobilization Board to allow quick tax writeoffs

WASHINGTON.—A new expansion program for oil-country tubular goods and two other major steel products hangs on a final decision expected from the Defense Mobilization Board next month.

At least two steel companies are prepared to build big pipe mills if they can get accelerated tax amortization. A Defense Mobilization official said last week other companies are expected to come in with plans for new plants if an expansion program is authorized.

Current indications are that the DMB will approve setting a new goal for tubular goods capacity. This was recently recommended in a report by the Interior Department's oil and gas office. Last week, it was understood the recommendation was supported by basic data submitted to ODM by the Commerce Department.

What's involved . . . Plants have been proposed by Jones & Laughlin Steel Corp. at Houston at a cost of $250,000,000 and by National Tube Division of U. S. Steel Corp. at Lorain, Ohio, and McKeesport, Pa., at a cost of $156,000,000.

ODM has rejected J. & L.'s application on grounds the plant is not essential to national defense.

The Commerce Department report to ODM estimated the increasing requirements for tubular goods over the next 5 years. It also gave figures on the material needs of the oil industry in the event of full mobilization.

Informal estimates place the number of wells to be drilled this year at 58,000 to 59,000. The number is expected to increase by 2,000-3,000 annually over the next few years.

New factor . . . The steel situation has been complicated by the new highway building program, which will take millions of tons.

But Mobilization Director Arthur S. Flemming leans toward a general policy which will take much of this out of the category of defense, although he agrees that some highways will have a direct defense status.

Flemming has explained that the criteria for expansion programs are the needs of the military, the requirements of war-supporting industries, and "rock bottom" civilian requirements. The current or future civilian requirements do not enter into the picture.

So far as roads are concerned, he has conceded that some will have a direct military importance. But he says that planning for mobilization does not include continuance of an all-out civilian economy. The "3 M's"—materials, money, and manpower—make that impossible, it is stressed.

The Interior and Commerce reports on tubular goods, together with Flemming's views, will be laid before the Defense Mobilization Board "after Labor Day," an ODM spokesman said. A quick decision is expected to be made.

Adena Decision Hit

Unit opponent challenges authority to limit output

DENVER.—Petroleum, Inc., of Kansas has challenged the authority of the Colorado Oil and Gas Conservation Commission to limit oil and gas production.

The company filed a complaint in Denver District Court asking for temporary and permanent restraining orders to halt enforcement of regulations applying to Adena field.

Petroleum, Inc., was the lone holdout when Adena, the state's second largest field in Morgan County, was unitized last December with Pure Oil Co. as operator. It remained outside the unit but is affected by the July 31 order limiting production from the "J" sand to 14,000 bbl. of oil and 25,173,000 cu. ft. of natural gas daily.

The complaint alleges that powers granted by the Colorado Legislature to the commission violate both the state and national constitutions.

The legislature provided that the commission could limit production and establish allowables in any field so that each property would have "the opportunity to produce or receive its just and equitable share."

Petroleum, Inc., position . . . This authority, according to the company, permits the state agency "to take away the property of owners of oil and gas interests."

Also, the suit charged, the legislature "has attempted to invest the commission with authority to interfere with the natural underground movement of oil and gas."

A June survey revealed that oil was draining across lease lines because of bottom-hole pressure differentials, resulting in violation of correlative rights of several operators and royalty owners. Production under the commission order is allocated by a unique formula. It is the first time that oil in place under individual leases has been used for this purpose (*The Oil and Gas Journal, August 13, page 100*).

Court Favors Union

O.C.A.W. strengthens bid for rights of predecessors

DENVER.—The Oil, Chemical and Atomic Workers International Union has staked a strong claim to bargaining rights with all firms previously recognizing the two unions which merged into O.C.A.W.

The organization bases its claim on a new ruling by the National Labor Relations Board, which held that O.C.A.W. is a continuation of the old Oil Workers International and the Gas Coke and Chemical Workers Union. The two merged in March of 1955.

Although the board's decision involved only the Edgewater workers of the National Carbon Co. in Cleveland, Ohio, the union said it "removes all doubts of the legality of O.C.A.W.'s bargaining rights with the various employers with which the two predecessor unions had bargaining rights."

The five-member panel ruled unanimously that the company should bargain with O.C.A.W. and that it was guilty of unfair labor practices by failing to do so.

National Carbon had contended that O.C.A.W. had no right to represent the Edgewater employes because the old chemical workers union had been certified as the bargaining agent.

National Carbon may appeal the board's decision to the federal courts.

Ten Supertankers Ordered

NEW YORK.—Ten more 45,000-ton supertankers have been ordered from two Japanese shipyards by Tidewater Oil Co. And the firm is reportedly considering a contract for two 65,000-ton vessels with a third Japanese builder.

Two 45,000-ton tankers, the Veedol and the Waffre, have already been delivered to Tidewater by Mitsubishi Shipbuilding Co., which will build eight more between now and 1959. Names of the other firms were not disclosed.

The tankers cost about $7,700,000 each. They will be assigned to the Arabia-San Francisco run. An official of Mitsubishi said the orders mean the company will have its yards "full and in continuous operation for the next 46 months."

OCTOPUS-LIKE underwater gravity meter helps . . .

Oil Hunters Survey Lake Erie

LEAMINGTON, Ont. — A strange, octopus-like mechanical fish is roaming the bed of Lake Erie these days. It's the weird advance scout for oil hunters.

The 240-lb. contraption is an underwater gravity meter cradled between three hydraulic pontoons. In the picture above Murray McCulloch of Radar Exploration Co., Toronto, is preparing to send one of the gravity meters to the bottom of the lake.

The gravity meter is lowered by winch over the side of the boat and down to the lake bed. The gravity meter is linked by cable to an instrument panel aboard the boat. Readings on it give the relative gravity at each test spot along the lake floor.

Then by mapping these findings, geophysicists can get an idea of the density of the underground rock formations. This enables them to determine if further exploration may be worth while.

Radar Exploration is conducting the Lake Erie survey for Imperial Oil, Ltd., which has an Ontario government permit to explore 30,000 acres of the lake bed. It has two parties working the lake this summer.

North Texas Unit, Flood Asked

WICHITA FALLS, Tex.—A unit and water flood planned for the shallow Gunsight sand under roughly 1,200 acres in old Wichita Falls Regular field in North Texas is expected to net an added 2,000,000 to 9,000,000 bbl. of oil.

Magnolia Petroleum Co., which has the bulk of the acreage in the area, is proposed unit operator. The Texas Co. and Staley, Staley & Langford hold the remaining working interest.

All operators have approved the unit agreement and 83 per cent of the royalty interests has signed.

Production in the area was discovered in 1914. The 1,700-ft. Gunsight in the proposed unit area is a stratigraphic trap of the lens type on a nose plunging to the north.

There are 140 producing wells in the unit area making an average of about 1.3 bbl. per well daily. The area is in the stripper stage of primary depletion. Magnolia terms it reasonably well defined by development. Productive area of the entire reservoir is estimated at 1,275 acres, of which 1,175 will be flooded. The unit takes in 1,750 acres.

The flood . . . The Texas Railroad Commission now is considering operators' plans to form a unit and water flood the properties. The commission is expected to approve the application.

Plans call for converting 18 of the producing wells to injection service and drilling another 34 inputs for a total of 52. The injection wells will be on an approximate 20-acre, five-spot pattern. About 5,200 bbl. of salt water daily from the Canyon lime (2,113 ft.) and the Ellenburger lime (2,837 ft.) will be injected into the Gunsight by gravity flow.

Magnolia estimates original oil in place in the unit area at 20,000,000 to 30,000,000 bbl. It fixes residual oil saturation at abandonment at 14 to 38 per cent of pore space. Present saturation is estimated at 40 to 60 per cent of pore space. Cost of the flood will run about $1,400,000.

Flaring of Gas Hit

Plants might be required to police big Texas field

AUSTIN.—The Texas Railroad Commission may require natural-gasoline plants in big Jameson Strawn field of Coke County, West Texas, to help police the flaring of casing-head gas there.

Chairman William J. Murray, Jr., told Jameson producers at a hearing here last week that too much casing-head is being flared in the field and that gas-oil ratio tests have not proved an effective check.

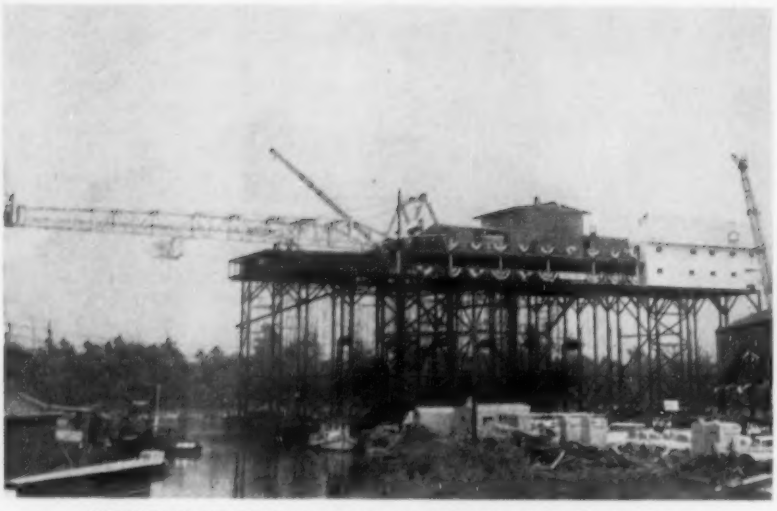
Murray indicated that the commission will direct Jameson gasoline plants to refuse to take substantially more gas from a lease than the legal limit of that lease. If a lease should exceed its legal limit before the plant shut it off, the overproduction would have to be made up.

If the lease should continue to produce after shut off by a plant, the commission would shut in the lease.

John Cameron, head of the commission's gas department, pointed out that 69 of the field's 119 leases produced over their legal gas limits in May. Illegal casing-head production for that month, he said, came to 703,369,000 cu. ft.

The legal gas limit for an oil well in Texas is determined by multiplying the top allowable for the well by the volume of gas which could be produced under the maximum permissible gas-oil ratio. The maximum ratio is automatically 2,000 to 1 under Texas law unless changed by special order of the commission.

Cameron said that Jameson gas is being flared because producers are exceeding their legal gas limits. This, he said, has caused overloading of the two gasoline plants in the field which are owned by Sun Oil Co. and Texas Hydrocarbon Co.



MOBILE PLATFORM of new offshore drilling firm is outfitted with . . .

World's Largest Draw Works

HOUSTON.—The largest draw works ever built has been installed on a mobile drilling platform being built here for Morris & Hamilton, Inc., newcomers in the offshore drilling business.

The draw works is incorporated in a Wilson Manufacturing Co. Super Titan "66" rig, which is one of the largest ever manufactured. Driven by 2,400 hp., the rig is designed for drilling to 20,000 ft. with 4½-in. drill pipe. With use of 3½-in. pipe it has a depth rating of 25,000 ft.

Independent diesel engines driving the rotary and mud-mixing pumps bring total available horsepower on the entire rig to more than 3,600.

The Lee C. Moore cantilever-type mast has a capacity of more than 1,000,000 lb.

Designed for operations in 30 ft. of water, the platform is Morris & Hamilton's first unit for drilling in the open gulf. The Houston-based company now operates one bay barge and three land rigs.

The mobile platform was dedicated August 17. It is scheduled to leave soon to start drilling for The Texas Co. in 30-ft. water off the Louisiana coast.

Hull of the vessel is 230 ft. long, 99 ft. wide at one end, 75 ft. wide at the slot end, and 11 ft. 9 in. deep. The lower of two decks on the platform is 65 ft. above the bottom of the basic hull. Deck structures are supported by fixed columns.

Sprague Welding & Machine Works employed an unusual technique in constructing the vessel. The upper structure was built on top of the lower hull deck. Then columns were erected and hydraulic jacks raised the superstructure to its present position.

Wild gasser mocks drillers . . .

. . . Pipe Stuck In Relief Well

ABBEVILLE, La.—Troubles mounted for Union Oil Co. of California last week as it attempted to drill a relief well to bring under control a wild gasser off the coast of Louisiana.

Drill pipe was stuck at 7,240 ft. in a directional hole through which the operator hoped to kill the burning well.

The flaming gas well is Union's A-1 O.C.S. 0297. It is in Block 26 of the Vermilion area, about 7 miles south of Pecan Island field.

A spokesman for Union said the stuck drill pipe was the only difficulty which had been experienced in drilling the directional hole. He expressed confidence that it could be freed and drilling resumed in a few days.

The wild well has been out of control since early June when it hit a high-pressure sand at 11,435 ft. *(The Oil and Gas Journal, June 18, page 144).* As a result of the blowout, the platform and drilling rig toppled into 25-ft. water in the Gulf of Mexico, causing a loss of equipment estimated at about $2 million. Gas spewing from the well later was ignited as a safety precaution, making a giant torch still visible for miles.

Another platform was hastily erected about 1,500 ft. northeast of the blowout to permit drilling a relief well.

The slow and costly directional drilling job started in mid-July. The relief well was slanted at an angle of about 10°.

Drill pipe became stuck August 21, the thirty-ninth day after spudding of the well. Because of the extreme caution required in such an operation the bit had averaged drilling less than 200 ft. per day since spudding.

L.P.G. Storage Set

Gulf Coast salt wells are approved for two firms

HOUSTON.—Underground storage of liquefied petroleum gas in two Gulf Coast salt domes has been approved by the Texas Railroad Commission.

Wanda Petroleum Co., Houston, has been authorized to leach out two cavities in the Pierce Junction salt plug. They will hold approximately 150,000 bbl. of L.P.G.

In neighboring Chambers County, Tennessee Products Pipe Line Co. has authority to develop underground storage for approximately 250,000 bbl. of L.P.G. The cavity will underlie a 29-acre tract in the Barbers Hill field area.

Where it's going . . . Tennessee Products Pipe Line is a recently formed subsidiary of Tennessee Gas Transmission Co., Houston. The subsidiary recently put into operation a 240-mile pipeline to move mixed products from a gasoline plant near Banquete, Tex., to a point near the Houston Ship Channel where a fractionating plant is now under construction *(The Oil and Gas Journal, August 13, page 100).*

Butane transported from the Banquete plant will be sold to Petro-Tex Chemical Corp. for use in manufacture of butadiene. Petro-Tex is jointly owned by Tennessee Gas and Food Machinery & Chemical Corp.

Surplus products from the South Texas gasoline plant will be stored in the Barbers Hill salt dome. The Railroad Commission extended the storage permit to authorize additional cavities under the 29-acre tract. Tennessee Gas has announced plans for eventual storage of 1,250,000 bbl. of L.P.G. in that area.

A spokesman for Wanda Petroleum said L.P.G. will be moved by truck from various Gulf Coast gasoline plants to the new Pierce Junction storage project. The company now stores L.P.G. in four salt caverns in Wood County, Texas.

L.P.G. Line to Expand

Magnolia plans to take products from 20 natural-gasoline plants in West Texas over its Midland-Gulf Coast pipeline

DALLAS.—Magnolia Petroleum Co. revealed last week that it plans ultimately to take L.P.G. products from 20 natural-gasoline plants in West Texas for shipment through its products line from Midland to the Texas Gulf Coast.

The products line is an 8 and 10-in. carrier converted from crude service by Magnolia early this year *(The Oil and Gas Journal, February 13, page 94)*. Principal sources of L.P.G. for the operation so far have been El Paso Natural Gas Co.'s big Midkiff plant in the Spraberry and the Magnolia-operated plant in Pegasus field. Throughput has been mostly butane.

Capacity of the line is about 25,000 bbl. of products daily, but deliveries to the Beaumont area have been less than half this volume.

Magnolia did not specify names and locations of the additional plants it plans to connect in West Texas. But it is known that the company is planning to extend the western terminus of the line from Midland into Andrews County to plants in that county.

Storage at Midland . . . The company signaled its upcoming expansion of L.P.G. operations in West Texas with an application to the Texas Railroad Commission in Austin last week to construct large-scale underground storage facilities at its big crude and products terminal and tank farm near Midland.

A Magnolia engineer told the commission the company wants to create two 50,000-bbl. storage cavities in a salt formation between 1,700 ft. and 2,652 ft. The company plans to leach out the cavities using fresh water and to dispose of the salt water through a disposal well in the Santa Rosa formation at 1,000 to 1,350 ft.

The Midland project would provide Magnolia with large-scale underground storage at both ends of its 540-mile products line.

The company has for the past several years been drilling wells and hiking storage capacity at its huge underground storage system in the Hull salt dome about 30 miles west of Beaumont.

L. P. G. from West Texas is refractionated at the Beaumont refinery. Normal and isobutane are separated and minor quantities of propane and naturals split off. The bulk of the products then move through existing lines to underground storage at Hull.

The operation is a long-range Magnolia program to bring large volumes of West Texas L.P.G. products to the gulf for use in heavy industry or for export and possibly as feed stocks for refinery operations as octanes continue to climb.

U. S. May Seek Imports Cutback

Fuels committee task force completes hearings, expected to recommend cut in crude imports to Flemming next week

WASHINGTON.—The cabinet fuels committee task force wound up its closed-door hearings on oil imports last week after a plea by a jobber spokesman urged the lifting of restrictions on residual fuel.

The task force will file its report with Mobilization Director Arthur S. Flemming next week. It has given no hint of the recommendation it will make, but observers expect the group to call for a cutback in crude imports.

The report will follow closely new estimates by companies showing 1956 imports of crude will be 17 to 20 per cent above 1955 (see page 66).

A new look at the import situation was asked of the cabinet committee by Flemming last May. The task force which made the original study for the committee 2 years ago was recalled.

Receipt of the committee's report next month will be followed by the setting of a date for a hearing on a plea for action under the national security clause of the Reciprocal Trade Act. The petition was filed last month by 19 domestic producer associations.

It is not expected that the committee will have any suggestions for dealing with residual-fuel imports. Originally in excess of the formula set out in February 1955, residual imports were quickly brought into line and are not now a subject of concern.

Hearing rules set out . . . General rules for hearings on domestic industries' pleas for protection against imports under the act were laid down by Flemming last week.

The first hearing will come in advance of the one sought by domestic oil producers. The rules will be tried out next month when the domestic cordage and twine industry states its case against imports.

Flemming said that requests to be heard must be about 2 weeks in advance of the hearing. Only parties having a material interest in the case will be heard. The time of witnesses will be limited. But briefs or statements may be filed up to within 5 days of the hearing and written rebuttal of statements or testimony may be filed in the 10 days following the hearing.

The hearing will be conducted by ODM's general counsel and a verbatim transcript will be taken. No cross-examination of witnesses will be allowed but questions may be asked by and through the presiding officer.

Tidelands Rehearing Sought

AUSTIN.—Atty. Gen. John Ben Shepperd of Texas has filed a request with the state Supreme Court for rehearing on its decision knocking out state ownership of 572 acres in Copano Bay, Aransas County.

The court ruled against a state argument that it owned all submerged land in gulf tidewaters from a level of 1.1 ft. It decided in favor of Russell S. Ponder, Sun Oil Co., and others who claimed the level should be .4 ft. based on Spanish-Mexican law prior to 1840. The decision reportedly affects all Gulf of Mexico tracts surveyed before that date.

Shepperd argued in his motion that the decision, if allowed to stand, would damage Texas' effort to get the federal Government to recognize the state claim that its boundary extends out 3 leagues into the gulf.

Asphalt Plant Almost Ready

PASADENA, Tex.—Texas Asphalt & Refining Co. will put its 2,500-bbl. asphalt plant into operation here early in September. Initial output will be about 2,000 bbl. daily.

The refinery, designed for an ultimate capacity of 5,000 bbl., will manufacture all grades of paving asphalt and fluxes for industrial use. Modern laboratory facilities have also gone in.

Texas Asphalt built the plant, located on the Houston Ship Channel, in cooperation with General American Tank Storage Terminals. Pona Engineers, Inc., Houston, handled the engineering and supervised construction. Texas Asphalt was formed late last year.

Texas Allowable Cut

Commission adopts 15-day producing rate, but is ready to "open throttle" if flow of oil from Middle East is slowed

AUSTIN.—The Texas Railroad Commission has decided to choke back Texas oil production slightly in September.

But it is prepared to yank the throttle open if the Suez situation should reach a point where the Middle East oil flow is impaired.

The commission adopted a 15-day producing schedule for September. This will result in a daily producing rate of 3,297,954 bbl.

This is 61,136 bbl. daily under the allowable as of August 4 and 86,790 bbl. daily below the figure initially estimated for August on a 16-day producing schedule.

The commission said it favored retaining a 16-day producing rate due to what it termed "a satisfactory stock situation" and the Suez crisis. It settled on 15 days, however, because crude buyers were unanimously in favor of cutting the state's September oil flow below August levels.

Actually, only four of the major buyers—Sun Oil Co., The Texas Co., Continental Oil Co., and Humble Oil & Refining Co.—wanted a rate as high as 15 days. Seven sought a 14-day pattern, while Phillips Petroleum Co. asked for only 13.

Individual buyers continued to express concern over excess stocks. Phillips said it is still faced with having to start pipeline proration despite having managed to sell some crude to other buyers.

A Phillips spokesman said 13 days of production in September would provide Phillips with more crude than it will need, and that "unless things change" the company might have to prorate in September.

Magnolia's D. R. Wall said the company is going to storage with 700,000 bbl. of crude this month and still would be adding 200,000 bbl. a month with a 14-day producing rate. Wall said the sharp buildup in storage was due primarily to a substantial cut in runs at its large Beaumont, Tex., refinery.

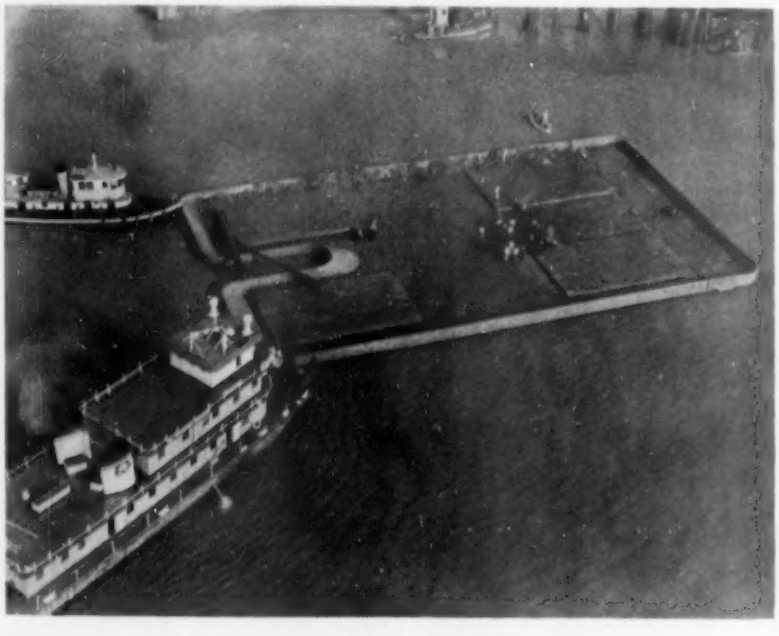
New state-wide rule . . . The commission announced at the hearing that it was issuing a new state-wide rule permitting installation of permanent-type completions where desired in multizone structures.

The new rule has been issued as an addition or amendment to Rule 12c, which requires that all flowing wells be equipped with tubing set no higher than 100 ft. above the top of the pay or 50 ft. above the top of the blank liner.

The amendment states that bottom of the tubing in the permanent-type completion may be set as high as 100 ft. above the top of the pay or perforated interval, but in no event at a height of less than 70 per cent of the distance between the surface and the top of the interval exposed to production.

TEXAS SEPTEMBER ALLOWABLE

District—	September	Change from Aug. 4
1—Southwest	72,617	— 714
2—Gulf Coast	151,597	— 4,664
3—Gulf Coast	457,955	— 5,679
4—Southwest	253,777	— 5,028
5—East Central	48,332	— 945
6—Outside E. Texas field	133,668	— 3,376
6—East Texas field	204,622	— 8,134
7-B—N. Central Texas	202,105	— 3,517
7-C—W. Central Texas	196,337	— 3,828
8—West Texas	1,144,800	—22,780
9—North Texas	285,883	— 2,932
10—Panhandle	146,261	461
Total	3,297,954	61,136



Barge Still Riding On Back

NEW ORLEANS. — A $1,500,000 drilling barge which capsized in the Mississippi River near here August 10 was still upside down late last week.

The barge was nearing completion at the yards of Avondale Marine Ways, Inc., when it suddenly started listing. Within minutes it had capsized *(The Oil and Gas Journal, August 20, page 107)*.

Being built for Southeastern Drilling Co., the vessel was scheduled to be delivered to the purchaser a week after it overturned. It had been contracted to drill for The California Co. in the Bay Marchand area off the Louisiana coast.

The Coast Guard last week started an inquiry to determine the cause of the disaster, in which three persons were killed. A fourth is still missing. Cause of the mishap has not been announced.

Testimony in the Coast Guard hearing brought out the fact that a 140-ft. derrick had been mounted on the barge before it overturned. In addition, 134 joints of drill pipe and an equal number of casing joints had been stacked on the deck. The pipe started rolling off the barge when the deck listed an estimated 30° to 45°.

The barge was at least partially covered by insurance. Equipment valued at about $1,000,000 was on the vessel when it capsized in water estimated at 90 ft. in depth.

Workmen were expected to make their first attempt to upright the barge within a few days. The 2,500-ton vessel was being kept afloat by air pumped into the hull.

Arctic Hunt Pushed

● Norman Wells drilling will be resumed by Imperial after 11-year lapse

CALGARY.—Drilling has been resumed after a lapse of 11 years in the most northerly oil field on the North American Continent—only 85 miles south of the Arctic Circle.

The field is Norman Wells, a Devonian oil-producing area in Canada's Northwest Territories. Location is on the north mainland of the famous Mackenzie River with some wells on Goose Island and Bear Island in the river. The area is about 1,100 air miles north of Edmonton.

Imperial Oil, Ltd., which discovered the field in August 1920, has a four-well development program under way now. One of Imperial's own rigs is being used. The first well has been drilled, and crew is testing while drilling the second well.

All of the wells will be drilled on the mainland. Two or three may be whipstocked under the river.

Why the revival? . . . The development work is being undertaken to provide increased production to serve the Norman Wells refinery.

The processing plant is playing a vital role in supplying fuel for aircraft of the distant north, for the boats and tugs of the great inland waterways, and for the mining industry.

The refinery has a capacity of between 1,300 to 1,400 bbl. daily. At the present, wells in the field are producing about 1,000 bbl. daily from 20 producers. The 1955 field production totaled 404,219 bbl. of crude, and the cumulative production through May this year was 4,973,413 bbl. A total of 83 wells have been drilled in the field.

A long story . . . Imperial built a small refinery at Norman Wells in 1921 hoping that mining activities in the vicinity would be stimulated.

The market failed to develop. Imperial capped the two wells the next year and closed down the plant. Radium-bearing and silver ores were discovered in 1930 near Great Bear Lake. New attention then was directed to oil possibilities at Norman Wells. Imperial in 1933 improved equipment and reopened the plant to refine aviation gasoline.

In 1934 gold mining started in the Yellowknife area on the north side of Great Slave Lake. Two more wells were drilled at Norman Wells to meet the increased demand for oil. They stepped up production to 450 bbl. daily.

Biggest spur to Norman Wells came during World War II from needs of the U. S. Army in Alaska and northwest Canada. Imperial participated in the Canol project by increasing refining capacity from 800 to 1,100 bbl. daily and drilling 64 producing oil wells.

Since the war, Imperial has explored 75,000 sq. miles of the Arctic for possible oil reserves. Oil, however, has not been found in commercial quantities.

Forced Allowable Retained

OKLAHOMA CITY. — Oklahoma's oil allowable for September and October will continue at 602,000 bbl. daily. Purchasers nominated only 559,882 bbl. daily, but the Corporation Commission retained the high allowable despite warnings it might lead to a price break.

State Conservation Director Massena B. Murray conceded the present market demand is probably not firm enough to stand the full amount of Oklahoma production. But he said he is hopeful the situation will improve in September.

The commission also retained a provision in the order threatening contempt action against any purchaser failing to take the full allowable unless granted exception by the commission. Gulf Oil Corp. is now testing the legality of this order in federal court here.

Texas Tax Rebate Ordered

AUSTIN.—El Paso Natural Gas Co. last week appeared to have won finally its suit against Texas to recover money paid the state under the invalidated natural-gas-gathering tax.

District Judge Harris Gardner ruled that the company was entitled to recover the taxes paid plus interest, which comes to a whopping $2,658,935.

El Paso was one of several pipelines which failed to pay the tax under formal protest. Those who paid under protest collected quickly following a U. S. Supreme Court ruling that the tax was unconstitutional in February 1954.

Navy In New Grab

● California operators lodge protest over plans for aerial-gunnery range

BAKERSFIELD, Calif. — Navy and oil are rattling their sabers again over the explosive issue of military land withdrawals.

San Joaquin Valley operators have filed protests with the Navy over plans to set aside vast areas of western Kern County for use as aerial gunnery and bombing ranges.

Navy wants two big areas, one of which would lop off more than half of Midway-Sunset field, California's busiest last year in development drilling. This reserve would extend from north of McKittrick to south of Taft in Kern County. The other proposed zone is a 40-mile triangle which cuts across Kettleman Hills field.

The reserves have been earmarked as practice ranges for planes from Navy's new $80,000,000 airbase near Lemoore. They would be used for jet bombing, strafing, and rocket-firing practice.

San Joaquin oil men are protesting on grounds that the reserves would hamper aerial pipeline patrols and shut down development drilling in the oil-rich areas involved.

They recently came up with a case of the jitters when a radio-controlled target plane went out of control. Rocket-firing attack planes attempting to shoot it down riddled some oil equipment and fired an oil sump at Indian Oil Co.'s refinery in Placerita Canyon near Newhall.

The operators are pointing to the incident as an example of what they fear might happen if the gunnery ranges are established.

Previous arguments . . . The question of military land withdrawals flared up in a big way early this summer when Navy apparently was thwarted in an attempt to set aside some 35,000,000 acres of valuable gulf oil lands off Louisiana *(The Oil and Gas Journal, May 14, page 106)*.

Last month, the House interior committee favorably reported out a bill which would require congressional approval before any area of more than 5,000 acres could be withdrawn by the military *(The Oil and Gas Journal, July 30, page 135)*.

Congress adjourned before final action could be taken on the measure, but Chairman Clair Engle of California said the committee's approval of the bill should serve to prevent further withdrawals until the lawmaking body reconvenes in January.

Suez Talks Run Into Snag

Oil industry stepping up emergency plans as uneasy calm marks crisis; Egyptians having trouble operating canal

AN uneasy calm prevailed in the Suez crisis last week. Forces of moderation were at work, postponing for a time at least any world explosion from Egyptian seizure of the important waterway.

This was the picture:

. . . **In London,** diplomats of 22 nations wrestled over an acceptable formula for control of the canal. The United States and Russia, as usual, were at odds.

. . . **In Washington,** moves continued to have machinery ready to step up oil production and transportation in other areas to serve Western Europe in case the canal is closed.

. . . **In Cario,** Egyptians got a taste of the trouble they may expect in operating the canal alone.

. . . **In the oil industry,** there were more straws in the wind that no matter what happens to Suez big tankers will assume an ever larger transportation role for Middle East oil.

Old foes meet . . . The London conference on Suez became a repeat performance of other international gatherings with the United States and Russia winding up on opposite sides of the table.

All hands in London apparently are agreeing to one important fact: Egypt has sovereignty over the canal.

Disagreement has arisen over who will operate the long ditch. The U. S., backed by 17 other nations, including four in the Arab-African-Asian bloc, has proposed operating the canal by an international group. Russia, representing Egypt at the parley, has the support of India, Ceylon, and Indonesia for complete control and operation by Egypt.

Reports from Cairo quoted Egyptian President Gamal Abdel Nasser as saying U. S. proposals for international management of the canal were unacceptable to Egypt. Nasser refused to attend the London conference. But he has professed willingness to negotiate future control of the canal if Britain and France withdraw their Middle East military reinforcements.

While the diplomats talked, war-like moves were softpedaled. Missing were any new threats of nationalizing Middle East oil fields or pipelines. British officials, who earlier ordered a state of alert and dispatched military units to strategic areas in the Mediterranean, also kept their counsel.

Emergency meetings . . . With no quick settlement of the crisis in sight, U. S. officials pressed their plans to supply oil to the free world if an emergency arises.

Mobilization Director Arthur S. Flemming called meetings of the Military Petroleum Advisory Board and the Middle East Emergency Committee. He asked them to commence studies of world supply and demand on which action can be based if the crisis becomes an emergency.

Flemming asked the MPAB to work up figures on current availability of domestic oil that can be delivered at seaboard. The group is to supplement the data-gathering work of the emergency committee. It and the government agencies will deal with questions affecting domestic oil. The emergency committee will confine its work to the foreign side of the problem.

The calling of the MPAB, an authoritative source said, will meet fears expressed by domestic producers that the problem will be left entirely in the hands of men from companies interested in operations abroad. The MPAB, it was pointed out, includes representatives of independent as well as major interests, and comprises a cross section of the whole domestic industry.

As the emergency committee prepared to meet, the 13 original members were supplemented by Cities Service Oil Co., which also has been added as a member of the Foreign Petroleum Supply Committee.

The actual plan of action for handling any emergency is being perfected. Details of the program may be made public within a week if it is agreed that publication will not compromise national security.

The broad outline of the plan was disclosed earlier this month by Flemming *(The Oil and Gas Journal, August 20, page 100)*. Questions arising when the emergency committee met to start its work necessitated some changes, which have now been worked out.

Meanwhile, two other announcements revealed what may be ahead.

Venezuela reported it could increase oil production by 20 per cent or 460,000 bbl. daily. U. S. officials revealed that 35 T-2 tankers now in mothballs could be put into service in 3 months.

Western Hemisphere production increases and a coordinated tanker fleet are expected to be the West's answer to any closing of the canal.

Trouble at canal . . . Smooth operation of the canal itself was threatened last week by a shortage of pilots. The problem, however, was aggravated by the political crisis and not caused by it.

There is a long-standing shortage of trained pilots. About 250 are needed to run the waterway efficiently. There are now 207, including 40 Egyptians. If the present crisis drags on, losses of pilots through sickness or death would complicate the shortage since few Egyptians can qualify for training.

The personnel pinch was underscored when a dozen or so pilots on leave refused to return to Egypt. The usual two convoys per day had to be cut to one at least once last week. Egypt immediately refused to permit other pilots to take leave unless the holdouts returned.

One British pilot who balked at returning to the canal complained he had been working 280 to 300 hours monthly. He said there had been accidents and incidents recently because of lower training standards for pilots due to use of unqualified Egyptians.

There were reports that the Egyptian Government has threatened to discriminate against British and French vessels using the canal if British and French pilots quit their jobs.

The Egyptian operators, according to diplomats, will clear British and French ships through the canal only after vessels of other nations have passed through. The Egyptians plan to recruit Greek and Egyptian pilots to replace the Anglo-French pilots who leave.

Big tanker boom . . . Oil men pointed out last week that Middle East oil was heading toward a transportation problem even if the Suez crisis hadn't arisen.

The canal currently carries about 60 per cent of Europe's crude. About 15 per cent comes through eastern Mediterranean pipeline terminals and the rest from other sources.

Organization for European Economic Cooperation has estimated that consumption in Europe will reach 3,570,000 bbl. daily by 1960 compared with 1,860,000 bbl. daily in 1955. The total is estimated at 7,140,000 bbl. daily by 1975.

Supertankers now coming on the shipping scene in increasing numbers

were expected to carry a share of the huge increase in crude supplies for Europe. But with the prospect of political unrest and operating trouble at the canal, they may assume their important role much sooner.

Ships in the 60,000 to 80,000-ton class could economically make the run to Europe around the Cape of Good Hope. An 84,000-ton tanker was launched this month in Japan. Three others as large or larger are under construction *(The Oil and Gas Journal, August 20, page 122)*.

Ships of 45,000 tons or more can carry crude economically around the cape to the U. S. Six tankers of this size or larger are now in service, and 17 more are on order. Another dozen tankers of 50,000 tons or more also are on order, excluding the Japanese-built ships.

Data compiled by John I. Jacobs & Co., Ltd., charterers, showed that companies and tramp operators increasingly are leaving behind the limitation of the 35-ft. draft which is the limit the canal can carry.

Seventy-nine ships from 38,000 to 44,999 tons are on order. None of them could travel the canal fully loaded, even when present work deepens the canal to 36 ft. in 1957. Of the 99 ships on order from 33,000 to 37,999 tons, only the lighter ones could make the waterway with a full load.

Andean Slope Is Surveyed

An airborne magnetometer survey of 23,338 sq. miles along the eastern slope of the Andes Mountains in Peru near headwaters of the Amazon River is being undertaken by Fairchild Aerial Surveys, Inc., Los Angeles.

The survey is a Fairchild venture and will be available to any company. Four American companies are participating initially in the project. They are Peruvian Pacific Petroleum Co., a joint venture of Cities Service Co. and Richfield Oil Corp.; Peruvian Gulf Oil Co., a subsidiary of Gulf Oil Corp.; Mobil Oil Co. del Peru, a subsidiary of Socony Mobil Oil Co., Inc.; and Cerro de Pasco Corp., an American mining firm whose activities are largely confined to Peru.

Fairchild began preliminary work more than 2 years ago when it photographed the region from the air. These maps will guide pilots in the magnetometer survey. Polar navigation equipment also will be used for added accuracy. The heart of the equipment is a gyro unit about the size of a baseball which spins at 22,000 r.p.m. It limits navigational error to less than 1° per hour and originally was designed for planes flying a commercial route across the Arctic.

The traditional photo is a bit different as . . .

Japanese Break Ground for New Refinery

A 30,000-BBL. refinery is being built at Tokuyama, Japan, 800 miles southwest of Tokyo, by Idemitsu Kosan Co., Ltd. Estimated cost is $25 million.

Shinto priests supervised the groundbreaking (see photo).

Process units include atmospheric and vacuum crude distillation, fluid catalytic cracking, Platforming, Unifining, Unisol, and an asphalt plant. The contractor is Japan Gasoline Co., agent for Universal Oil Products Co. which licensed four of the processes. Completion is scheduled next year.

A carbon monoxide-fired boiler will utilize the waste CO gas produced in the cat cracker when the catalyst is regenerated.

Jamaican Wildcat Nearing Total Depth

THE first Jamaican wildcat of a Stanolind Oil & Gas Co. subsidiary is drilling ahead below 4,512 ft. in limestone and chert.

The 1 Santa Cruz, located on Santa Cruz mountain 60 miles west of Kingston, is being drilled by Jamaican Stanolind Oil Co., which has exclusive rights on the entire Caribbean island and offshore to an average distance of 12 miles.

Jamaican Stanolind took over the license early this year from Base Metals Mining Corp., Ltd., Toronto, which retained 25 per cent interest *(The Oil and Gas Journal, January 9, page 74)*. Base Metals found promising shows last summer in the first well ever drilled in Jamaica. The Stanolind test, spudded June 3, is 45 miles south and east of the 1 Base Metals.

Half-mile, hand-cut jungle road leads to remote but promising African test

Oil Show Raises Nigerian Hopes

THE long and costly exploration program in Nigeria at last may have hit pay dirt.

The country's first "good show of free oil" has been found in a 12,000-ft. wildcat, 1 Oloibiri, drilled east of Port Harcourt.

The joint Shell-British Petroleum Prospecting Co. said confirmation offsets will be drilled. The first will be completed in May.

While not claiming a commercial field on the basis of one well, officials have talked guardedly about a pipeline to Port Harcourt on the Bonny River.

The company said cost of a line and terminal would be about the same as the value of 10,000,000 bbl. of crude. This does not include the cost of field development, but indicates the minimum reserves needed for commercial production.

If a good field were developed, a pipeline to the coast would present no legal problems. The Nigerian house of representatives recently passed a law covering acquisition of lands by a company wishing to move crude to a port.

A major discovery in Nigeria would unquestionably benefit Britain. It would provide, to some extent, a secure source of sterling crude from an area fairly close to home—other than the tempestuous Middle East. The Nigerian economy, basically agricultural, also would be bolstered.

First success . . . The O'oibiri wildcat is the eleventh in an 18-year exploration program which already has cost more than $31,000,000.

The best previous well was at Akata in Calabar Province which had a moderate show of oil in 1954. Six offsets, however, were dry.

Other wells in recent years have teased Shell and B.P. with shows of oil or gas, but none turned out to be commercial *(The Oil and Gas Journal, January 2, page 66)*.

Most of the current activity is taking place east of the Niger River. Shell and B.P. also are carrying on some work in Calabar and Benin provinces.

Socony-Vacuum Oil Exploration Co. (Nigeria) has permits covering the northern section of the country. Preliminary geological surveys now are under way.

B.P. in Senegal . . . B.P. will participate in exploration farther northwest in West Africa through interest in Ste. des Petroles du Senegal.

B.P. Exploration Co. will have 20 per cent interest, and Ste. Francaise des Petroles B.P., 30 per cent. French interests holding the remaining half will include Bureau de Recherches de Petrole, 30 per cent, F.I.N.A.R.E.P. and C.O.F.I.R.E.P., 10 per cent each.

The new firm will acquire a permit over 15,600 sq. miles in Senegal granted to Ste. Francaise des Petroles B.P. in May.

B.P. Exploration also holds a concession over neighboring Gambia. It has offered the French Bureau de Recherches a 50 per cent interest in this operation.

Depletion Allowance Passed

The Israeli Government has granted a depletion allowance to both domestic and foreign-based operators.

The allowance is patterned in general after U. S. regulations. But some provisions are more liberal and depletion has been made retroactive to the beginning of exploration.

Israel's percentage depletion is 27½ per cent on gross income from crude and natural-gas production if the allowance is not more than half of the net income. Cost depletion, based on

investment in oil and gas rights, can be used rather than percentage depletion if the cost is higher.

Israel also permits geological and geophysical expense to be charged as exploration costs and carried as operating expenses.

German Tests Hit

Four new producers pep up West German oil prospects

FOUR new wells in West Germany have given further encouragement to the nation's prospering oil industry.

A wildcat drilled by Gewerkschaft Brigitta Mobil Oil A.G. made a discovery 2 miles northeast of Vechta, in northwest West Germany. The well, Oythe 4, is expected to produce from 60 to 75 bbl. daily on pump from 3,720-3,800 ft.

An offset to the discovery well in Elsfleth field in the Weser-Ems region also has come in as a producer. The 3 Elsfleth, drilled by Gewerkschaft Elwerath, flowed 95 bbl. daily of water-free crude on production tests.

In Bavaria, Heimertingen field was extended to the north and northeast by Tests 6 and 7. Each of the wells yielded 95 bbl. daily on pump. The operating company, Deutsche Schachtbau und Tiefbohrgesellschaft m.b.H., has staked two more stepouts.

Gas output doubles . . . Steadily growing natural-gas production in West Germany the first half of 1956 nearly doubled output of the first 6 months last year. Output averaged 35,600,000 cu. ft. daily.

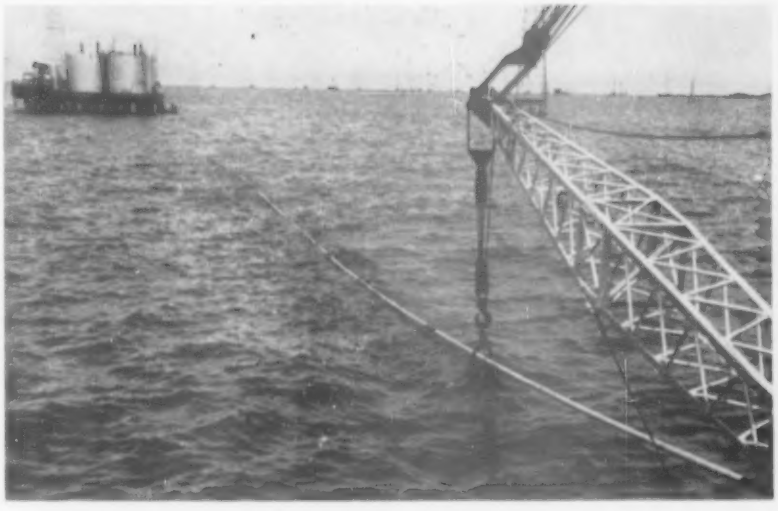
Most of the gain was accounted for by Rehden field near Diepholz in the northwest part of the country. The new field produced 17,600,000 cu. ft. daily the first half, most of it going to the steel industry at Osnabrueck.

Japanese Plan Houdriformer

Daikyo Oil Co., Ltd., of Tokyo, will build the first Houdriforming unit in the Orient at its Yokkaichi refinery. The 3,000-bbl. installation is due for completion next summer.

It will produce high-octane gasoline from high-paraffin, high-sulfur naphthas derived from Middle East crudes. The catalytic reformer will consist of three catalytic reactors and Houdry's integrated pretreat catalytic guard-case reactor for feed stock purification. In-place regeneration of platinum catalyst has been provided for.

Houdry Process Corp., which designed the unit, will do part of the engineering work. Refinery Engineering Co. of Tulsa will do the rest.



Aluminum Pipe Tried in Lake Maracaibo

ALUMINUM crude lines may be the answer to the shipworm nuisance in Lake Maracaibo.

An experimental line of uncoated aluminum was laid in the brackish Venezuelan lake 6 months ago by Creole Petroleum Corp. And it appears to have solved the corrosion problem.

Creole turned to aluminum because the usual measures to guard against corrosion don't work in Lake Maracaibo. The reason is a tiny shipworm called the teredo. The acquatic pest bores through the protective coating applied to steel pipe and exposes the surface to salt water.

With the help of Aluminum Co. of America, Creole designed an experimental line, 4-in. in diameter, to carry crude from a single offshore well 700 ft. to a flow station (see photo). It was welded from 40-ft. joints, each weighing about 150 lb., and submerged in water 15 to 20 ft. deep.

The 6-month checkup revealed virtually no corrosion damage. Success of the experiment points to use of aluminum pipe on other lake installations.

International BRIEFS

What has been reported as Romania's largest refinery, plant No. 10 in Moldavia, has begun partial operation, the Romanian News Agency reported. No figures on capacity or processing units were given but the agency said Romania now has 10 refineries with a production capacity 2.2 times higher than in 1954. All Romanian oil now is refined in domestic refineries and only refined products are exported.

A 14-mile crude-oil pipeline from the refinery at Batman, Turkey, to the Raman oil field has been completed. A second pipeline, 15.5 miles long, is scheduled for completion soon between the refinery and the Garzan oil fields. The Batman refinery is expected to meet one-third of Turkey's present petroleum needs.

The third of seven U.O.P. Platformers contracted for in Italy has gone on stream at the 45,000-bbl. refinery of Condor S.P.A. per l'Industria Petroliferia e Chemica at Rho. The 5,500-bbl. unit will produce a leaded gasoline-blending component with an octane rating of 96-plus.

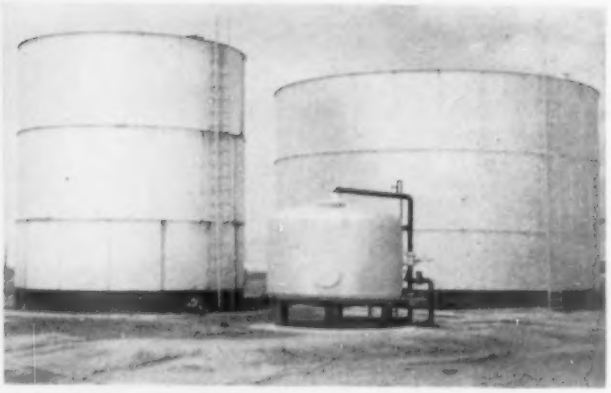
British Petroleum Co., Ltd., has started an intensive seismic survey in southeastern Sicily to stake a location for the company's second test on concession areas of the island. B. P.'s first Sicilian test was drilled near Vittoria in 1953 and 1954. It was abandoned after oil shows proved to be noncommercial.

The drillling platform for the first well in Persian Gulf waters off the Trucial Coast shaikhdom of Abu Dhabi will cost $1,900,000. The platform is being constructed by the Gute Hoffnungshuette engineering works at Sterkrade, Germany, near Dusseldorf.

British Petroleum Co., Ltd., which owns a two-third interest in Abu Dhabi Marine Areas, Ltd., awarded the contract. The remaining interest is owned by Cie. Francaise des Petroles.

The new unit will be ready for delivery early next spring.

WATER-INJECTION installation of wellhead assembly is shown here. Tubing string is set in production packer and the annulus filled with fresh water.



WATER-HANDLING facilities are this 5,000-bbl. raw-water storage tank, 8 by 10 ft. sand filter, and 1,500-bbl. filtered water storage tank.

Five-Spot Water-Flood Unit

by Ward M. Edinger

Lincoln County field has 23 input wells, 17 producers, and one water-supply well

NORTHWEST Tryon field, covering portions of Sections 2, 3, 9, 10 and 11 of 16n-3e and portions of Section 34-17n-3e, Lincoln County, Oklahoma, was discovered in November 1949. Production is from the Red Fork sand (Penna.) at 4,100 ft. Reservoir data are summarized in an accompanying table.

Investigation of Secondary Recovery

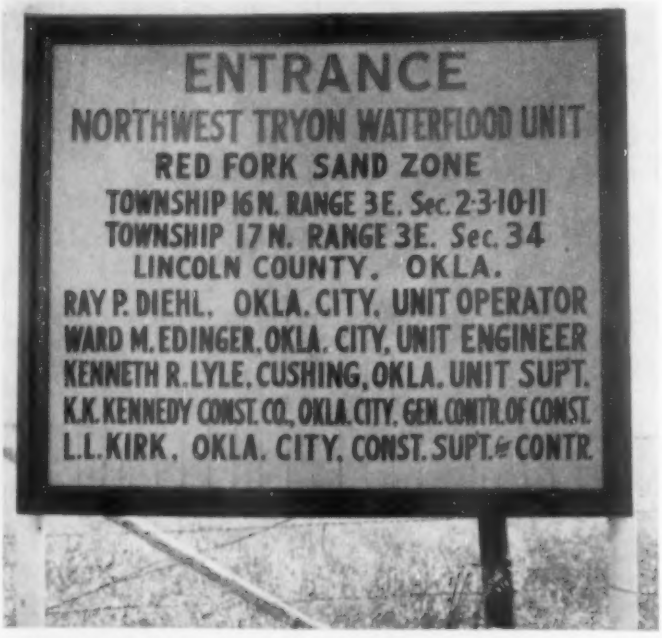
The operator of the field employed an independent engineer to investigate the possibilities of employing secondary recovery methods in this field and in August 1953, it was recommended that the field be water flooded. A formula was devised and accepted which allocated the interest on a basis of acre feet of floodable sand, primary production (from decline curves), and well density. Each of these parameters were weighted equally. The interests were unitized on the basis of 26 units of 40 acres each. The well density is approximately 20 acres per well, with the majority of wells being drilled on the northwest and the southeast of each 40 acres.

Water-flood plan . . . By converting 23 wells to input wells, 17 wells to producers, and 1 well to a water-supply well, the essential pattern is a 40-acre five-spot, with some exceptions for off-pattern wells. The water supply comes from the Layton sand at about 2,800 ft. This aquifer is about 44-ft. thick and one well, which had an initial capacity of 11,000 bbl. per day, has been supplying water at a rate of from 4,400 to 4,800 bbl. per day by means of a Reda pump.

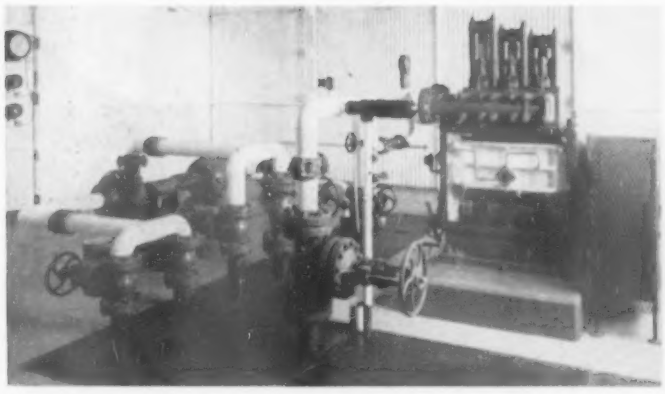
The water is brought into a 5,000 bbl. water-storage tank where it is protected from aeration by carrying an

Author is consulting petroleum engineer, Oklahoma City.

PRODUCING


ENTRANCE
NORTHWEST TRYON WATERFLOOD UNIT
RED FORK SAND ZONE
TOWNSHIP 16 N. RANGE 3E. Sec. 2-3-10-11
TOWNSHIP 17 N. RANGE 3E. Sec. 34
LINCOLN COUNTY. OKLA.
RAY P. DIEHL. OKLA. CITY. UNIT OPERATOR
WARD M. EDINGER. OKLA. CITY. UNIT ENGINEER
KENNETH R. LYLE. CUSHING, OKLA. UNIT SUPT.
K.K. KENNEDY CONST. CO., OKLA. CITY. GEN. CONTR. OF CONST.
L.L. KIRK. OKLA. CITY. CONST. SUPT. & CONTR.

THIS SIGN marks the entrance to the field. Ray P. Diehl died early in April 1956 and Kenneth Ellison is now the unit operator.



WATER PRESSURE is maintained by this vertical triplex pump, 7½-hp. backwash pump, and 10-hp. electric motor. A portion of the control panel is shown on the extreme left.

WATER SUPPLY is handled with this submergible electric-pump installation. A 97½-hp. 50-stage pump produces water at 4,000 bbl. per day.

Ups Production 38,000 Bbl.

oil seal. The water is picked up by a 2 by 3 2-hp. centrifugal pump. It is pumped through an 8 by 5-ft. sand filter and stored in a 1,500-bbl steel storage tank, carrying an oil seal. Then, the water is distributed to the field.

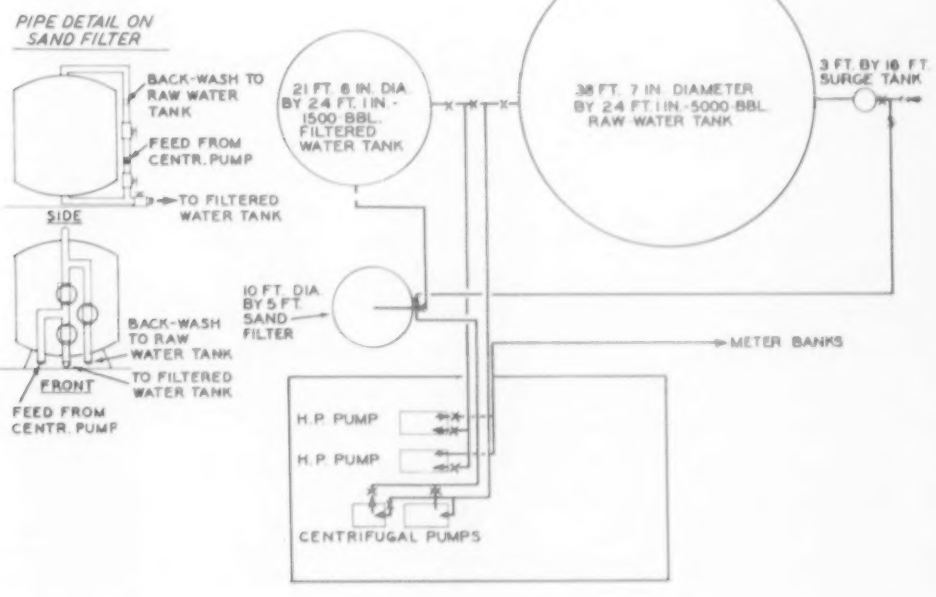
The water at present is distributed by gravity head, since the plant is located at the highest elevation in the field. However, a vertical triplex pump, capable of delivering 4,234 bbl. per day at 825 psi., has been installed and will be used when required. When necessary the filter is backwashed by means of a 10-hp. 4 by 5 centrifugal pump.

Water Injection System

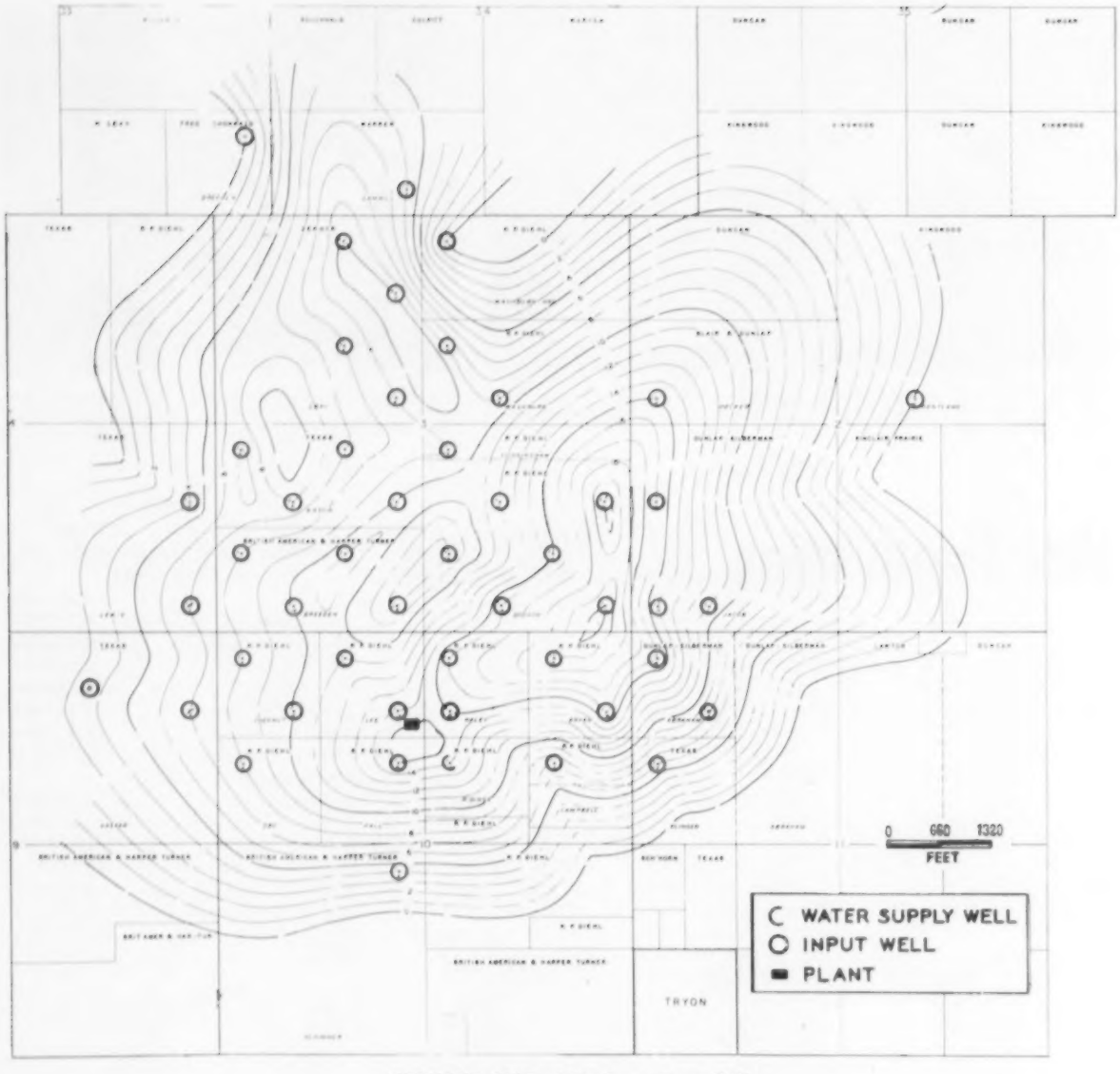
The distribution system consists of three main headers which includes a pressure gage, a nutating type water meter, and necessary check valves. Each meter bank takes care of approximately one-third of the injection wells. Daily records of both the pres-

PARTICIPATING INTERESTS—NORTHWEST TRYON WATER-FLOOD UNIT

	Per cent
S. C. Canary & Associates	8.219927
Fred P. Schonwald	2.054981
Sam Raymond	2.813921
The Texas Co.	10.130689
Arthur Silberman	0.449484
Abraham Silberman	11.343950
Marcel Silberman	1.745275
British-American Oil Prod. Co.	5.469867
Harper Oil Co.	4.911656
Warren Petroleum Corp.	1.547593
Kenneth A. Ellison	10.552747
W. W. Whiteman, Jr.	2.638187
Hilseweck Minerals Corp.	3.810715
Ray P. Diehl, et al.	34.311008


PIPE DETAIL ON SAND FILTER
BACK-WASH TO RAW WATER TANK
FEED FROM CENTR. PUMP
TO FILTERED WATER TANK
SIDE
21 FT. 6 IN. DIA. BY 24 FT. 1 IN. - 1500 BBL. FILTERED WATER TANK
38 FT. 7 IN. DIAMETER BY 24 FT. 1 IN. - 5000 BBL. RAW WATER TANK
3 FT. BY 10 FT. SURGE TANK
10 FT. DIA. BY 5 FT. SAND FILTER
METER BANKS
BACK-WASH TO RAW WATER TANK
TO FILTERED WATER TANK
FRONT
FEED FROM CENTR. PUMP
H.P. PUMP
H.P. PUMP
CENTRIFUGAL PUMPS

LAYOUT of the Northwest Tyron water-flood unit.



CONTOUR MAP of Northwest Tryon field.

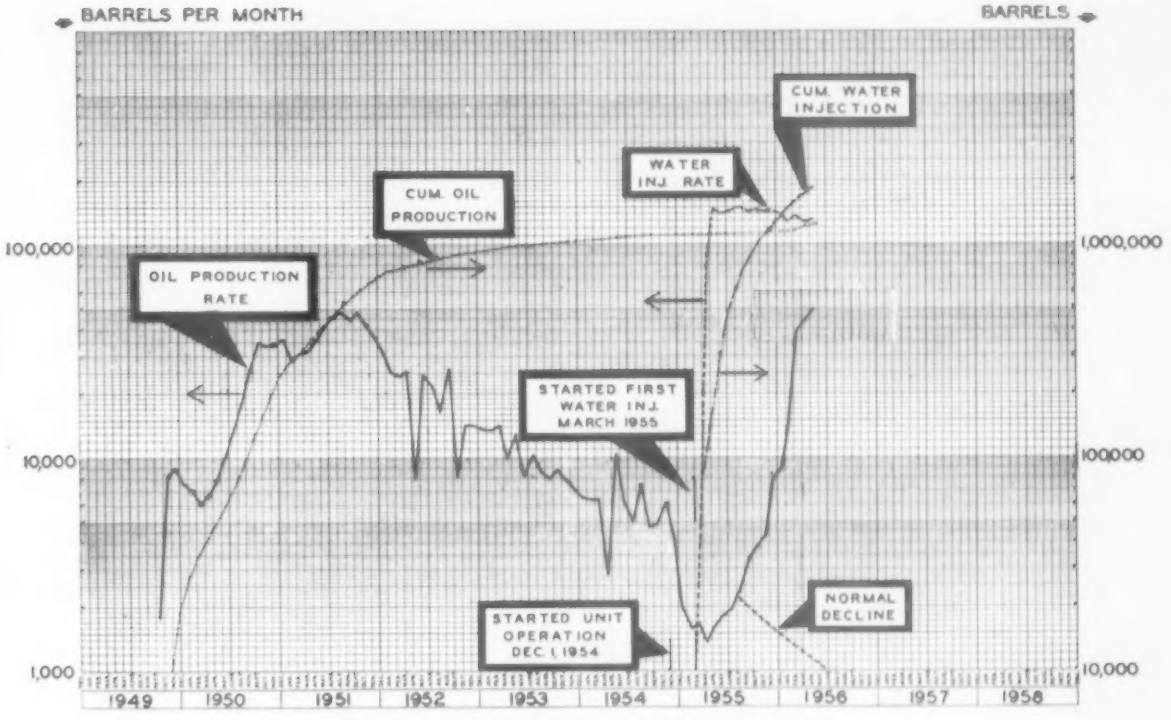
Production Increase . . .

"When the unit operator assumed control, in December 1954, the production level was 4,102 bbl. per month. After converting 23 of the wells to input wells and 1 well to a water supply, the production continued to drop and reached a minimum of 1,361 bbl. in April 1955.

"Since then the production has continued a slow but steady increase and the first production attributed to the water was in August 1955."

FIELD DATA, NORTHWEST TRYON WATER FLOOD, APRIL 1956

Date of first water injection,	March 1, 1955
Daily average water injection, bbl.	4,264
Monthly water injection, bbl.	127,913
Cumulative water injection, bbl.	1,859,724
Daily aver. water-flood oil production, bbl.	1,425
Monthly water-flood oil production, bbl.	42,741
Cumulative water-flood oil production, bbl.	114,337
Monthly oil production (primary), bbl.	1,183
Daily oil production (primary), bbl.	39.33
Daily average total project water production, bbl.	38.20
Daily average water production with flood oil, bbl.	38.20
Average injection pressure, psi.	16.5
Number input wells taking water	22
Total number input wells	23
Total number producing wells	17
Number producing wells on production,	17
Number water supply wells	1



OIL-PRODUCTION rate and water-injection rate of the field.

sure and the water rates are recorded, without the necessity of a trip to each well. At present the average pressure at the headers is about 17 psi.

The injection wells were cleaned out and in some cases deepened. Tubing was rerun with a packer. The annulus was filled with fresh water.

The 17 producing wells are connected by a return system and all oil, water, and gas is brought back to a central tank battery. The gas is separated by a separator and the oil and water goes through a free water knockout and a heater treater. The oil is stored in the battery, which consists of approximately 5,700 bbl. of storage and the free water is returned to the injection system after being metered.

The wells are periodically checked by means of a portable well checker for production rate of oil and water.

The pumping units are being currently run from produced gas supplemented with butane-propane.

Flood Performance

When the unit operator assumed control, in December 1954, the production level was 4,102 bbl. per month. After converting 23 of the wells to input wells and 1 well to a water supply, the production continued to drop and reach a minimum of 1,361 bbl. in April 1955.

Since then the production has continued a slow but steady increase and the first production attributed to the water was in August 1955. By March 1956 the production has increased to 39,273 bbl. per month and will probably be in the order of 45,000 bbl. for the month of April 1956.

Drawdown tests on the fluid levels indicate that the reservoir is currently capable of producing in excess of 80,000 bbl. per month, but that production is being curtailed because of the size of the pumping units. A study is being made at this time to determine the advisability of installing larger pumping units.

The water production is negligible and at current level, production is only 3.2 per cent of the total fluid production. Likewise, gas production is estimated to be between 300 and 400 M.c.f. per day. It required approximately 1,600,000 bbl. of injected water to effect a fillup of this reservoir.

Material balance analyses have been somewhat uncertain, because a gas cap of unknown size occurs on the east flank of the field at a subsea depth of —3,115 ft. However, the fillup period has been within a month of that originally calculated.

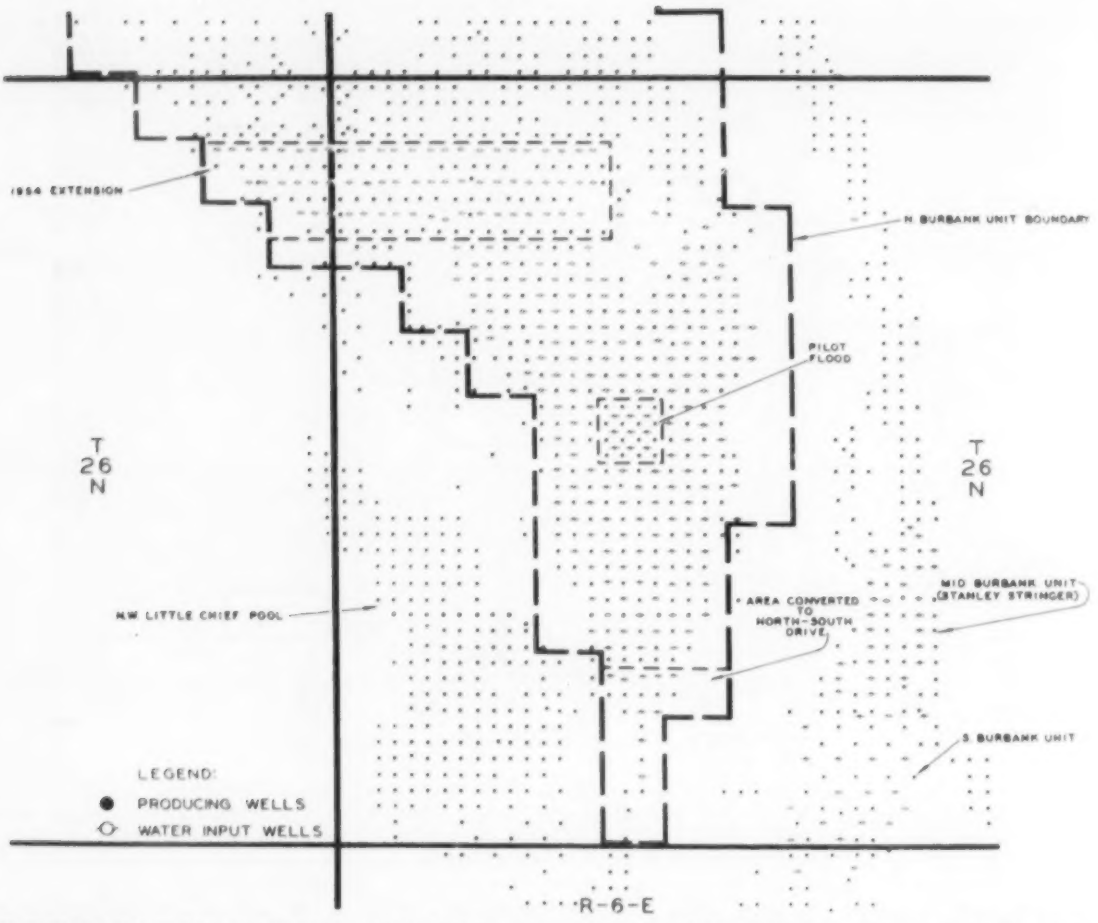
Operating Costs Are Low

Current operating costs are approximately 13 cents per barrel at the 40,000 bbl. per month level. The cost of installation of the plant, distribution system, and return system was approximately $138,000. It is calculated that the period of depletion of this reservoir will be approximately 6.5 years and, if the volumetric estimates are correct, it is anticipated that the total cost both of operation and installation will be less than 30 cents per barrel.

All input and producing wells were sand fractured and, to date, there has been only one case of suspected communication.

RESERVOIR DATA, NORTHWEST TRYON WATER-FLOOD UNIT

Area effective, acres	585
Area unitized, acres	1,040
Depth to top of sand, ft.	4,100
Average thickness of floodable sand, ft.	12.3
Volume of floodable pay, acre ft.	7,220
Number of wells utilized in unit area	41
Gravity of oil, °A.P.I.	40
Viscosity of oil at atmospheric pressure at 100° F., cp.	6.5
Solubility, cu. ft. per bbl.	380
Formation volume factor, bbl. per well	1.24
Saturation pressure, psi. gage	1,700
Connate water, per cent pore space	17.
Porosity, per cent	17.1
Average permeability, md.	83.
Original oil in place, bbl. per acre-ft.	888
Irreducible saturation, per cent pore space	20
Primary oil production, ultimate, bbl.	1,147,836
Estimated secondary production, ultimate, bbl.	1,858,000
Estimated secondary production, ultimate, bbl. per acre-ft.	258



NORTH BURBANK FLOOD PATTERN for initial development was a conventional 20-acre five-spot. Water bypassing through fractures has caused a change to an elongated five-spot to prevent loss of oil. Some 5,000 acres of the 19,000 productive acres are under flood. Fig. 1.

8½ Million Extra Barrels in 6 Years

That's the story of North Burbank Unit water flood

by Z. Z. Hunter

Here is what happened when naturally oriented fractures developed in a water flood. Usual water-flood planning and pilot-flooding operations didn't hint at the problems that arose. This is an example of how established practices and concepts may have to be changed for water flooding a new area.

THIS is a progress report of water flooding on the North Burbank unit of Osage County, Oklahoma, a large offshore bar-type stratigraphic trap. To date under water flood are 5,320 acres of the total of 19,300 acres considered productive in the unit. *(For development history and initial flooding of North Burbank see The Oil and Gas Journal, November 1, 1954, page 88.)*

Water flooding the Burbank sand has presented a number of problems resulting mainly from reservoir-rock conditions which were not anticipated at the beginning. The natural-fracture system, or fractures opened by the hydraulic pressure used in water flooding, are oriented in an east-west direction. This caused the unit owners to depart from a five-spot, 20-acre spaced pattern, resulting from converting alternate existing wells to water input, to a north-south elongated five-spot, 20-acre pattern developed by drilling new wells in alternate east-west rows.

This pattern was adopted in an endeavor to flood across the fracture system. New wells were drilled to prevent the loss of water from the reservoir to the overlying fractured shale zone which acted as a thief horizon. One year of experience with the new pattern is encouraging.

A further problem was declining fluid production rates despite sustained

Author is with Phillips Petroleum Co., Bartlesville, Okla. Paper presented at 1956 spring meeting of the Mid-Continent section of the A.P.I. Division of Production, Wichita, under the title, "North Burbank Unit Water Flood," January 1, 1956.

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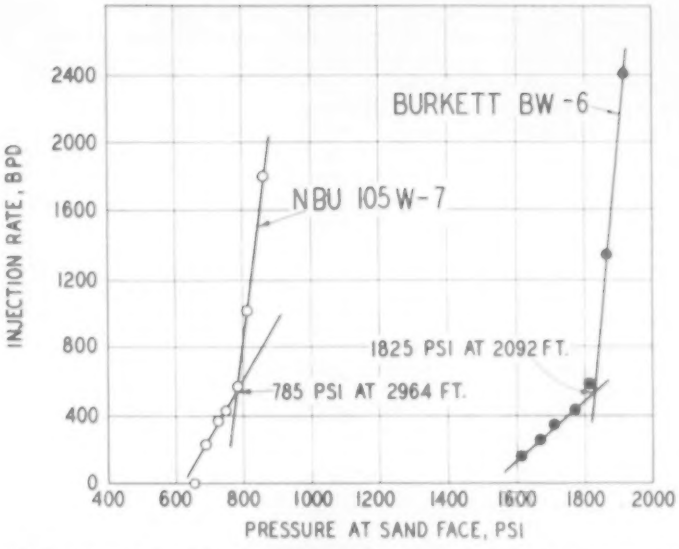
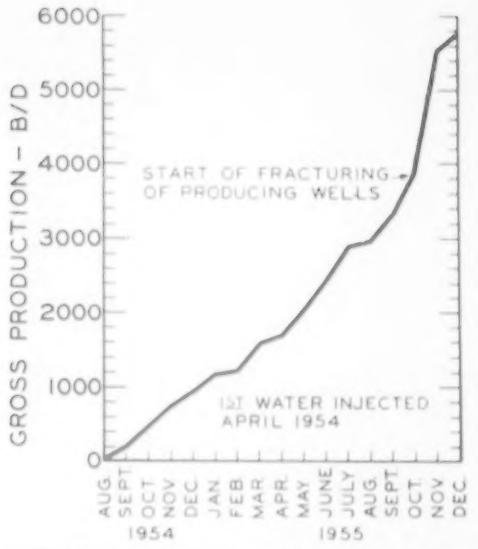


FORMATION BREAKDOWN during injection of water occurs at a gradient of 0.265 psi. per foot in North Burbank compared to 0.87 psi. per foot in Greenwood County, Kansas. Fig. 2.



FRACTURING of producing wells has upped production of the flood yet has not increased produced water in the 1954 extension. Fig. 3.

input rates and a 50 per cent increase in bottom-hole pressure. Although there is as yet no explanation for this, it can be overcome by formation fracturing.

Considerable progress has been made toward the solution of the problems. Further improvement in water-flood operations can be expected and the originally estimated reserve of 140 million barrels appears reasonable. In 6 years of water flooding, a total of 8½ million barrels of increased oil has been recovered. Current water-flood oil production amounts to 12,511 bbl. per day.

Waterflood Operations

At the time of the unitization of North Burbank operators, the unit area consisted of 18,310 acres but has since been extended to approximately 19,300 productive acres. The area had produced about 166 million barrels of oil—17 million barrels were produced as a result of gas injection.

Cores taken at widely separated points within the field indicated average porosity of the Burbank sand to be 16.8 per cent and connate water to be 28.5 per cent. Permeability varies from zero to several hundred millidarcys, with the north part of the field being considerably more permeable than the south.

The water-flood reserve was estimated to be 140 million gross barrels of oil to be recovered over a period of 30 years under a program of developing 1,000 acres per year. The program was designed to permit a maximum level of production of 20,000 bbl. per day to be sustained over a period of some 12 to 15 years.

Pilot flood . . . Immediately following unitization and leasing arrangements with the Osage Indian Tribe, the operators authorized development of a 90-acre pilot water flood providing nine five-spot water-injection wells on 10-acre spacing as shown in Fig. 1. The close spacing was used for two reasons: To provide an early anwser as to the application of the process to this field, and to secure detailed core information on the Burbank sand.

Water for carrying out the pilot test consisted of salt water, collected from isolated areas within the field producing salt water, augmented by fresh water from an industrial supply. Water was injected at reasonable rates at pressures equal to, or less than, the hydrostatic head. Fillup volumes, as expected, were equal to the gas-saturated pore space in the reservoir. Following fillup, water injection on this tract increased the normal production of 37 to nearly 1,000 bbl. per day.

Performance of the pilot flood was such that the operators authorized the development of a 1,000-acre 1951 extension and plans were laid to provide an adequate water supply.

Water supply . . . Water for the large-scale flood comes from the Arkansas River through the Ark-Burbank water system. Wells supplying water are some 100 yd. from the river and are completed in the alluvium. The wells are 48 in. in diameter, gravel-packed, and extend some 60 ft. to bed rock. Each well is capable of producing in excess of 40,000 bbl. per day.

Shaft-driven turbine pumps, installed in the wells, pump water directly into a 40,000-bbl. accumulator tank from which gas-engine-driven centrifugal pumps deliver the water through 7 miles of 30-line to the North Burbank unit and an 18-in. line from the North Burband unit delivers it to the other properties.

Flood extensions . . . Initial development of the flood consisted of converting alternate existing wells to water input, constituting a five-spot, 20-acre pattern, Fig. 1. The original wells in the field had 7-in. casing set some 200 ft. above the top of the sand, and a 5½-in. liner from that point to near the top of the sand. Neither the casing nor the liner was cemented.

To satisfactorily complete the wells for water-injection service, a string of pipe was cemented at the top of the sand to seal off the highly fractured shale section immediately above. Existing casing and liners were pulled and a full string of 4½ or 5½-in. casing was run to the top of the sand, as established by radioactive logs, and cemented at that point. The cost of converting existing wells to water input amounted to approximately half the cost of drilling new water-input wells. In this fashion, approximately 1,000 acres were developed for water flooding in each of years 1951, 1952, and 1953.

Operating Problems

The North Burbank water flood has presented new and unsual problems brought about by reservoir-rock conditions in addition to usual problems.

Initial response of the 1951 extension to the pilot flood was normal. As

an example, a quarter section located immediately south of the pilot flood increased in oil production from a normal of 50 to more than 1,100 bbl. per day. An adjacent quarter section increased from approximately the same level of production to more than 900 bbl. per day.

However, within a few months there was a sharp decline in the rate of water injection followed closely by a decline in both oil and water production. This was initially attributed to the problem common in water floods, that of water-input well plugging. It was not surprising, because simultaneously there had been the appearance of iron sulfide in the injection water, formed by the action of sulfate-reducing bacteria.

Efforts were made to remove the plugging material by the usual steps, such as back-flowing, acidizing, shooting, and the application of pressure. Only by means of increased surface pressure could reasonable volumes of water be injected.

Experience in other areas indicated that no damage to the formation should have occurred at surface pressures up to 1,000 psi. Very limited tests at North Burbank appeared to substantiate this experience. As a result, steps were taken to provide surface pressure of 300 psi. initially and to gradually increase it to 600 psi

The increased volume of water injected at 300 psi. surface pressure was far beyond that expected from the small increase in sand-face pressure. This was first attributed to breaking down the barrier formed by the plugging material on the sand face. Later this was found to be due to formation breakdown.

Bactericide . . . Simultaneously with increased water-injection pressure, steps were taken to preclude further plugging with iron sulfide. To combat sulfate reducers in the injection water, formaldehyde was introduced as a bactericide but was totally unsuccessful. In addition, a wide variety of other chemicals has been tested and as yet there has been no entirely satisfactory solution to the problem.

There also was a problem of post-filter precipitation of iron sulfide. Perfectly clear water could be obtained from the effluent of the filters and in a matter of 30 minutes to 1 hour there would be a pronounced precipitation of iron sulfide. This resulted from unreacted sulfide ion which, in time, would react with the iron present in the water. It was found that the sulfide ion could be oxidized by chlorination prior to filtration. This practice is being continued to date.

Water migrated . . . First evidence of something drastically wrong with the flood was a sudden influx of water into wells in the Stanley Stringer, about 1 mile east of the North Burbank water flood. However, inasmuch as the interval between the water flood and the Stanley Stringer was known to be barren of Burbank sand, it was difficult to accept the appearance of water in the Stanley Stringer as resulting from the North Burbank water flood.

A series of water-input-well performance tests consisting of pressure fall-off and volume versus pressure measurements were then undertaken. A number of input wells that exhibited unusual performance characteristics were shut in, and the production of water from the properties in the Stanley Stringer decreased almost immediately.

At this time a unit well being drilled offered an opportunity to make a drill-stem test of the shale section overlying the Burbank sand. The tests proved that the fractured shale was full of water with characteristics identical to the water being injected in the Burbank flood. It was then apparent that the fractured shale extending across the interval between the water flood and the Stanley Stringer was the avenue of water travel.

Directional fractures . . . Later an influx of Burbank flood water occurred in the West Little Chief pool lying west of the unit. The movement of water to areas outside the unit was unusual in many respects. Although the fractured shale was found to be full of water, none of the producing wells in the unit north of the water-flood pattern exhibited water production, even though these wells were protected from the fractured shale by only an uncemented liner.

In addition to the directional movement of water away from the reservoir, it also was observed that there were numerous instances of directional bypassing between the water-input well and a producing well or wells located east or west of the input well in question. There was no instance of a direct bypass from an input well to a producing well located to the north or south.

This suggested that fractures in Burbank were oriented in an east-west direction. In an endeavor to further establish this fact, an oriented core was taken on an infill well being drilled within the pattern. From this core it was found that fractures, or cleverages that could be ruptured to form fractures, were predominately in an east-west direction. Fracture direction was also determined by orienting old cores by residual measurements. These measurements confirmed the existence of the east-west fracture system.

Fractures are opened . . . In all probability the fractures exist in the rock as clevages that open at pressures of a hydrostatic head of water or less. Fig. 2 compares the injection rate at a function of pressure of a North Burbank water-input well with similar data on a water-injection well in Greenwood County, Kansas. These data reflect that the Burbank reservoir fails at a pressure gradient of 0.265 psi. as compared to a gradient of 0.87 psi. per foot of depth in Greenwood County. It is reported that water can be injected into Bartlesville-sand wells at Nowata County, Oklahoma, at pressures up to 1.25 psi. per foot of depth without damage.

Squeezing off shale . . . A program of squeeze cementing the casing shoes of abnormal input wells was instituted, and even the entire open-hole section was squeezed in some wells in an endeavor to prevent the loss of water from the reservoir and to minimize the bypassing through directional fractures. Squeeze cementing was carried out at pressures adequate to open any fracture or potential fracture.

The results of the program are clouded as to the loss of water from the reservoir program on the leases affected. However, a measure of relief was afforded by the remedial work in preventing water loss to the overlying shale. Generally, squeeze cementing was unsuccessful in preventing water bypassing to producing wells.

Fracturing Producers

It would appear contradictory that in a water-injection project in a fractured section such as Burbank there would be difficulty in producing reasonable volumes of fluid. In spite of the increase in water injection by the application of pressure, the producing wells continued to decline in both oil and water.

The relative ease with which water could be injected, together with the declining fluid production, resulted in an abnormal increase in reservoir pressure, measured at one point to be 1,860 psi., or some 50 per cent in excess of the original reservoir pressure.

Usual practices were used to increase fluid production, such as shooting, acidizing, and projectile perforating. No significant increases were obtained by these means. Hydraulic fracturing was used as a last resort, initially only on edge wells or on those wells where there was nothing to lose.

The operators were concerned by the fear, normal to water-flood operators,

that the creation of fractures could only result in abnormal water-oil ratios. This fear was particularly well grounded in North Burbank, where the existence of natural fractures had resulted in many instances of bypassing.

Encouraging results . . . Fracturing of the edge wells was encouraging. North Burbank unit owners authorized the fracturing of all the producing wells on one quarter section. Fracturing increased the rate of oil production on this tract from 200 to 980 bbl. per day. Prior to fracturing, the water-oil ratio was 2:1 and following fracturing was slightly less. The cause of the reduced productivity of producing wells within the water-flood pattern is a matter of conjecture, and as yet there is no adequate explanation. It has been established, however, that the reduced productivity can be overcome by hydraulic fracturing.

To increase the level of production, to lower the reservoir pressure, and minimize the loss of water from the reservoir, an extensive program of fracturing producing wells was undertaken. Now 186 wells, or 69 per cent of the producing wells within the water-flood pattern, have been fractured. This fracturing program as an adjunct to the water-flood operation has increased the current oil production rate by some 5,000 bbl. per day.

Particular emphasis is placed on the fact that the fracturing did not result in an over-all increase in water-oil ratio. There is good evidence that the ultimate recovery will be increased as a result of fracturing.

New well pattern . . . Knowledge gained from water-flood operations prior to 1954 showed that to insure inpecting water into the sand and to prevent its escape from the reservoir, old wells could not be successfully recompleted as water-input wells. The revised practice was to set casing at a point from 5 to 10 ft. below the sand top, except where vertical fractures were encountered, and then the casing should be set below the fractures and squeeze cemented.

The unit owners elected to plug existing wells in alternate east-west rows, and drill the new input wells at midpoints between the old locations. This well arrangement, shown in Fig. 1, is essentially a 20-acre five-spot pattern but instead of the usual square, the five-spot is a rectangle, 660 by 1,320 ft. This pattern uses a well arrangement similar to that on the pilot flood, in that the producing wells and input wells are arranged in alternate east-west rows. The pilot flood performed normally and better than any of the subsequent extensions.

Certain old wells in the lines of the water-input wells were observed after the initiation of water injection. These wells watered out quickly, and within a matter of months were uneconomical and were plugged.

Fracturing of the producing wells was deferred so the performance of this experimental pattern could be compared to previous extensions. This type of development proved far superior to previous developments and the performance was satisfactory.

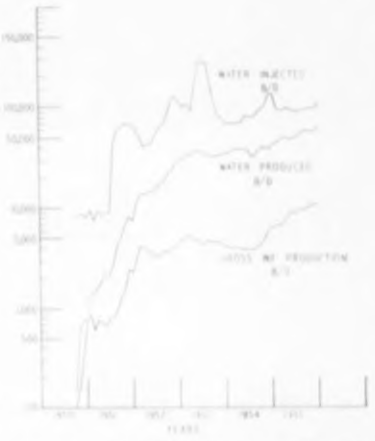
The extension had reached a level of production of 3,700 bbl. per day by October 1955, and was continuing to increase. Then, fracturing of the producing wells was initiated. Fig. 3 reflects the performance of this water-flood extension.

There has been only one instance of direct bypassing between a water-injection well and a producing well in the 1954 extension. This was an edge producing well which, after fracturing, effected a substantial increase in the rate of water injection in a well nearly ½ mile east-northeast of the producing well. Producing wells have accumulated substantially more oil prior to water breakthrough than in any of the past developments.

The success of the 1954 type of development caused the operators to authorize a similar extension for 1956, following a year during which no water-injection wells were added.

Switching producers . . . A portion of the older water-flood area has been adapted to the pattern of aligning water-input wells and producers in alternate east-west rows. Three wells were converted from producing status to water injection and five wells were converted from water-injection status to producers. Simultaneously with the change, eight producing wells in this pattern were fractured, clouding the benefits of pattern rearrangement. However, the combined effect of rearranging the pattern and fracturing increased the rate of oil production from 250 to 450 bbl. per day.

The performance of the five wells formerly used as water-input wells and subsequently converted to producers is particularly significant. These wells resulted in better-than-average producing wells. The outstanding example was one well which, after having had 590,000 bbl. of water injected, continually increased in oil production and decreased in water for 1 year, reaching a peak of 188 bbl. of oil and 21 bbl. of water. It is concluded that the water injected into these water-input wells was not effective in moving oil.



FIELD PERFORMANCE shows 8.5 million barrels recovered out of the estimated water-flood reserve of 140 million barrels. Fig. 4.

Evaluating floods . . . Water-flood performance at North Burbank demonstrates that an error in conclusion can result from attempting to evaluate a secondary-recovery program for a large reservoir from a relatively small pilot test. The North Burbank pilot was designed to give detailed core information and quick results, and by chance the water-input wells were aligned with the formation fracture system. Therefore, the pilot test did not reveal any condition that would lead the operators to expect anything but a normal water-flood operation when expanding the flood system throughout the field on a 20-acre five-spot pattern.

Fig. 4 reflects the performance of the water flood on the North Burbank unit. The erratic nature of the oil-production curve since initial water-flood response reflects the numerous operating problems encountered. The recent increase during 1955 demonstrates that progress is being made toward a solution of the problems.

Water flooding has resulted in the recovery of 8.5 million barrels of oil, to January 1, 1956, that would not otherwise have been recovered. The level of production as of January 1, 1956, resulting from water flooding, amounts to 12,511 bbl. per day, of which 5,775 bbl. comes from the 1954 extension.

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2. Labadie, George V. (Member Osage Tribal Council): Benefits Derived from Secondary-Recovery Operations in Osage County, Oklahoma, from a Royalty-Interest Viewpoint, address delivered before a joint meeting of the Engineering and the Secondary-Recovery and Pressure-Maintenance Advisory Committees of the Interstate Oil Compact Commission at Oklahoma City, December 1953.

1950—500 barrels per day
1956—6,000+ barrels per day

Water Flood Ups Production Twelvefold

Low oil saturation of analyzed cores made this nearly depleted sand a poor water-flood prospect. But experimental flooding showed it could be revived. Resultant field-wide water flooding has been very efficient.

by Arthur C. Simmons

THE Weir sand in eastern Kentucky has proved successful for water flooding in the Oil Springs area of Magoffin County. As a result, in 1955, Magoffin County ranked third in Kentucky production, producing 1,650,000 bbl. of oil. The county has always been important in the state's producing list. For the period 1918 through 1950, inclusive, it rated eighth in cumulative total production, this being approximately 13,300,000 bbl.

As to effect of water-flood production, in 1950 Magoffin County ranked seventh in the state with a rate of 500 bbl. per day. In contrast, at the present time, it is producing in excess of 6,000 bbl. per day. On an annual basis this is 2¼ million barrels and it possibly may place the county in second place within the state in 1956.

History . . . Weir sand production in Magoffin County was discovered in June 1919 with the drilling of the I Milt Wheeler well by Bed Rock Oil Co. There has always been some confusion regarding the name of the main and subsidiary pools in this area and in thinking of Magoffin County Weir sand production, it is necessary to include the pools under the names of Oil Springs, Twin Lick, Van der Pool Branch, Rock House, Mash Fork, and Burning Fork. Perhaps all of these pools should be included as a single producing area although locally great distinction is made between Burning Fork and Twin Lick.

Author is petroleum engineer and independent producer, Bradford, Pa. Paper presented at Kentucky Oil and Gas Association meeting, Lexington, Ky.

The above several pools altogether have a primary producing area of 6,700 acres and a total of 1,200 primary wells. Oil Springs pool separately includes 5,500 acres and this area includes the 200 acres and 30 to 40 wells which are located in Johnson County.

The primary production plus that attributable to air-gas repressuring totals about 13 million barrels to the end of 1950, when water flooding began to be important. On the basis of 6,500 productive acres within Magoffin County, therefore, the primary yield was 2,050 bbl. per acre and approximately 11,500 bbl. per well.

The pay-sand thickness in the outlying pool areas is not yet well defined as intensive coring and water-flood development has not extended to the edges. Nevertheless, it appears as though the pay-sand area will average 25 ft. Thus the resulting primary oil recovery is only about 80 bbl. per acre-foot. This primary production is fairly low on an acre-foot basis.

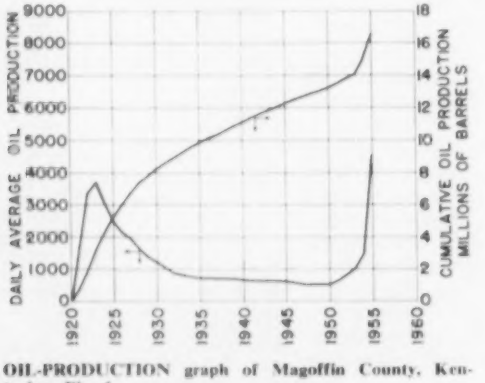
Production performance . . . Fig. 1 charts production for 1920 through 1955. The lower curve represents the average daily production, with a peak of 3,700 in 1923. The low point was 500 bbl. per day in 1947-1950. Influence of water-flood production first appears in 1950, the year 1955 yielded 4,500 bbl. per day.

The upper curve shows cumulative production to the end of 1955. These data indicate total primary plus air-gas repressuring production of 13,000,000 bbl. to the end of 1950, and 16,000,000 bbl. to the end of 1955. This indicates the water-flood production to date to be 3,000,000 bbl.

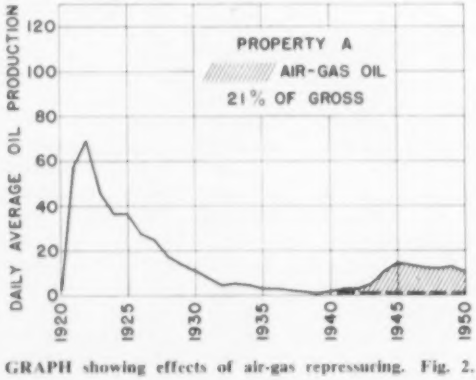
A study of the air-gas repressuring results developed some interesting facts. Figs. 2, 3, and 4 show the production which can be allocated to air-gas repressuring for properties A, B, and C.

Weir sand . . . This sand, located in the lower Mississippian series, is fine grained, light gray, and of uniform texture. It is found at depths of 900 to 1,200 ft. It is somewhat a "dirty" sand and caves following shooting.

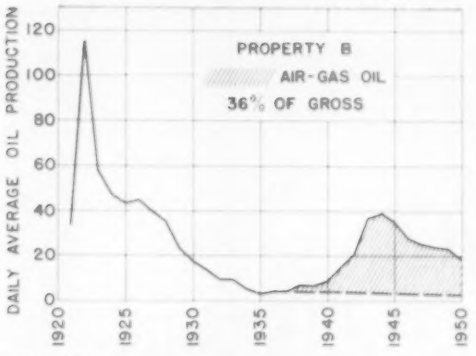
The producing zones are generally



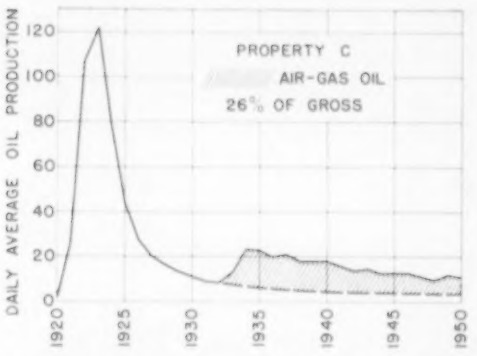
OIL-PRODUCTION graph of Magoffin County, Kentucky. Fig. 1.



GRAPH showing effects of air-gas repressuring. Fig. 2.



GRAPH showing effects of air-gas repressuring. Fig. 3.



GRAPH showing effects of air-gas repressuring. Fig. 4.

known as Stray sand, First Weir sand, Second Weir sand, and Third Weir sand. In some selected localities, there is even a Fourth Weir sand. Some confusion exists over the Stray and First Weir and the terminology of First Weir and Second Weir may be interchanged in different areas due to the presence or absence of the Stray sand.

In the Oil Springs area, the principal producing horizon is the First Weir sand although the Stray appears important in portions of the field. The lower sands are considered important in Lawrence County. Nearly all the flood production of Magoffin County has been obtained from the First Weir sand.

Water-Flooding Operations

Early coring efforts in this area during the mid-1940's indicated a high water saturation and low oil saturation. The core interpretations made at that time were discouraging regarding water flooding, as the low oil saturation shown by the cores was presumed to be below the economic limit for water-flood operations. The Weir sand, as a consequence, was temporarily rejected as a water-flood prospect and no activity was carried out until the fall of 1948.

At that time Cumberland Petroleum Co., under the direction of Joe Slagel, introduced water into eight wells. No results were observed in the remainder of 1948 or during 1949. A slight gain in production was realized in 1950 and the experimental flood yielded 11,000 bbl. of oil during the year.

In 1951 the pilot flood proved extremely promising. The production jumped to an average of 200 bbl. per day for the entire year. In 1952 the production increased to an annual total of 150,000 bbl., and in 1953 190,000 bbl.

The second flood in the area was conducted by Brundred Oil Corp. on the Cheek and Rice properties, with 15 intake wells starting in 1951. Oil production in 1952 was nominal but by 1953 some 33,000 bbl. of water-flood oil was produced from the development.

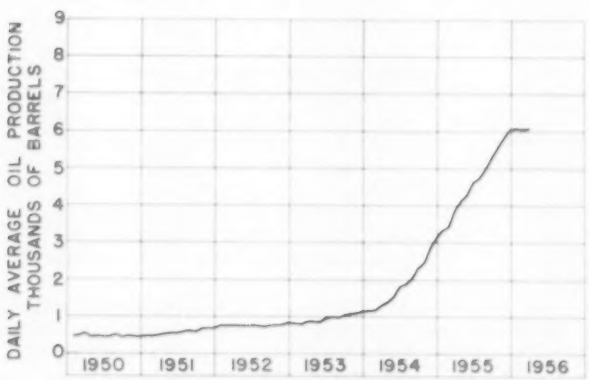
Fig. 5 charts oil production for Oil Springs pool. The stable production of 1950 rose slowly through 1951, 1952, and 1953, and rather sharply during 1954 and 1955. The present production is slightly in excess of 6,000 bbl. per day but it is too soon to state whether this represents a new peak, as partially developed areas have not yet produced water-flood oil. It is possible that the peak will be substantially higher than at present.

In the redevelopment of this pool, two separate methods or theories have been used. The most common method of development is to use all, or nearly all, of the old producing wells and add new intake wells and use the old powers for pumping.

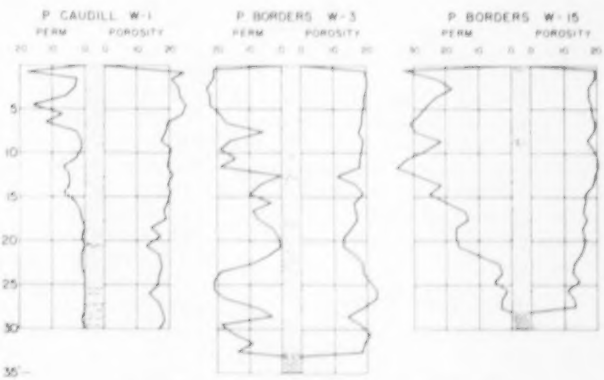
A different development approach has been carried out on some properties—one which represents a basic attempt at a reasonably uniform pattern. Truly uniform patterns are impossible in the area because of the extreme irregularity of property lines, but an approach to a true pattern layout is attempted. In this case, the water-intake wells are all new and the majority of the oil wells are also new. Only those old oil wells which fall in favorable locations and which are in favorable operating condition are used for the new project. Under these circumstances the old pumping equipment is relatively unusable, and new pumping units and lead lines are installed. It is too soon to conclude which of the two methods may be the more efficient.

The development in this area was tabulated by years, showing the number of acres and number of wells represented by the water-flood development for each calendar year, and an attempt made to correlate this with production.

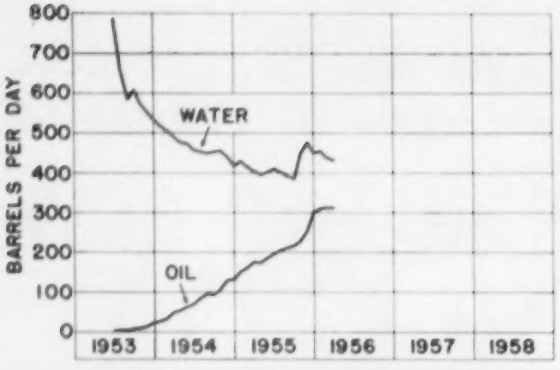
The correlation was difficult and somewhat confusing because a water-flood development is not always a finished and accomplished fact. First,



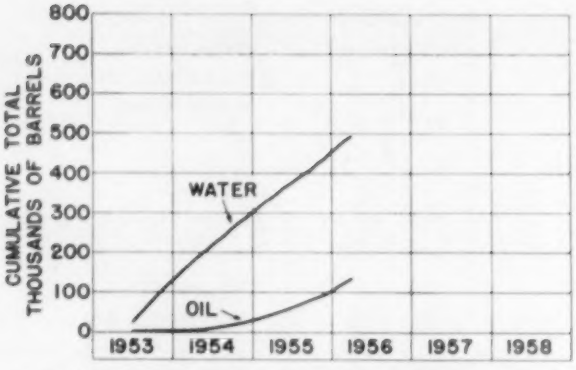
OIL-PRODUCTION graph, Oil Springs pool. Fig. 5.



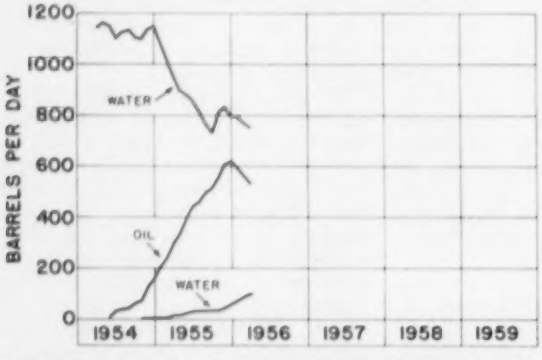
WEIR SAND cores, Oil Springs pool. Fig. 6.



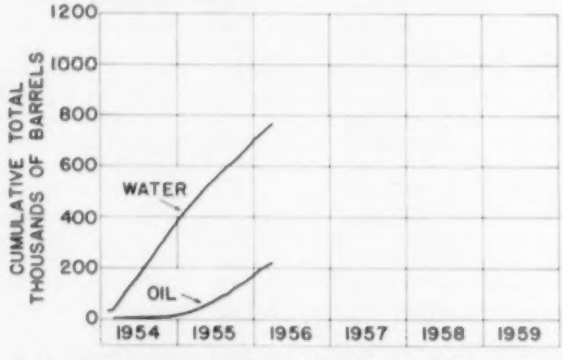
P. CAUDILL daily oil production and water injection. Fig. 7.



P. CAUDILL gross oil production and net water injection. Fig. 8.



P. BORDERS daily oil and water production and water injection. Fig. 9.



P. BORDERS gross oil production and net water injection. Fig. 10.

there is the time lag between the introduction of water and improvement in oil production either from old wells or from new producing wells. Secondly, there is a situation where substantial areas have been drilled for intake purposes, and where water has been admitted, but where the producing wells have not yet been drilled. As a result, substantial areas are only partially developed for water-flooding purposes.

At the end of 1955, 2,050 acres were under flood, but possibly as much as 400 to 500 acres were not yet producing water-flood oil. Consequently, the area which is under flood and producing water-flood oil may be only 1,500 to 1,600 acres. With a production of about 6,000 bbl. per day, there is an indicated average rate of 3.5 to 4 bbl. per acre per day.

The majority of the water-flood oil in this area is produced by five operators; however, there are an additional three or four smaller flooding operations. Small-scale experimental floods at the beginning of 1956 are: Magoffin County 5, Johnson and Lawrence counties 6.

Coring and Logging

Fig. 6 is a graph of three Weir sand cores which are typical of a particular area but perhaps not representative throughout the field. The cores include the W-1 Peter Caudill and W-3 and W-15 Patton Borders. The core graph shows the permeability and porosity profiles only. No effort was made in this particular illustration to show saturation characteristics. W-1 Peter Caudill core is illustrative of a condition in which the lower part of the sand becomes relatively impermeable and has a corresponding but lesser decline in porosity. The well has 22 ft. of permeable pay sand with average porosity of 20.2 per cent, and average permeability of 4.6 md.

The W-3 Patton Borders core shows a thickness of 32 ft., a porosity of 18.3 per cent, and permeability of 13.1 md.

The W-15 Patton Borders core had total thickness of 28 ft., porosity of 16.9 per cent, and permeability of 19 md.

Electric-logging service has been available in this area for some time and the operators make extensive use of this service by running conventional electric logs, caliper measurement, gamma-ray logs, and radioactive-tracer logs. Caliper logs have been very useful in both old and new wells.

The self-potential curve on a conventional electric log in this field has a well-defined characteristic but seldom shows much irregularity. The resistivity curve is negative in that the resistivity in the sand shows lower values than the shale-line resistivities. The low resistivity is an indication of interconnected connate water and possibly a higher-than-normal connate water content.

Gamma-ray logs have been used by one company to indicate the nature of the salt sand in water supply wells and shooting practices in the water supply wells have been modified by this information.

Some little work has been done on radioactive-tracer logs in an attempt to outline the water-intake rates in multiple sands. These interpretations are under discussion and no general practice has been evolved.

It is to be hoped that the electric-log measurements will lead to a better understanding of fluid contents within the sand and provide a guide to commercial or economic limits of water flooding where the edge of the field may be brought about by diminished oil and increased water-saturation values.

Table 1 shows by producing properties the average sand thickness, porosity, and permeability for an indicated total of 169 cores and an actual total of 144 cores. This discrepancy in numbers occurs because of the consideration of property averages. The cores taken along the common boundary line were used for two or more properties. Lease

No. 1 has a total of 25 cores and Lease No. 2 has a total of 24 cores although 6 cores are on a common boundary line and are used for each property summary.

These core data indicate uniform sand thickness and relatively uniform porosity and permeability. The sand thickness for Lease Nos. 7 and 8 are subnormal because of location near the edge of the field. The averages, as shown, are weighted by the numbers of cores involved and indicate an average sand thickness of 25 ft., porosity of 19 per cent, and permeability of 10 md.

All of these characteristics are extremely favorable for water-flooding operations, there being an adequate sand thickness with desirable porosity and permeability values.

Table 2 is a presentation for 15 cores, 8 of which were taken using water as coring fluid, and 7 with oil as coring fluid.

The oil saturation for the oil-base cores has only nominal interest for, in coring with oil, a distorted oil saturation is to be expected.

The interesting parts of this table are the oil-saturation values found in the water-base cores, and the water-saturation values in the oil-base cores. The oil saturation in the water-base cores was 16.2 per cent with a minimum of 13.9 per cent and a maximum of 18.9 per cent. The spread between the minimum and the average and the maximum and the average is comparatively narrow. It is very likely that this minimum oil saturation represents the residual-oil saturation after complete water flooding.

Water saturation in the water-base cores averaged 45.2 per cent and was originally believed to be exceedingly high and represent a large amount of water absorption during the coring process.

The purpose of taking the cores with oil as coring fluid, was to make a more accurate determination of water saturations. The seven cores taken in oil yielded an average water saturation of 39.1 per cent and the results on five were extremely close to this average.

Cores 4-B and 5-B show a somewhat wider spread but the average of these is very close to the general average of 39.1 per cent. Distortions which may occur in this determination are not readily apparent and temporarily we may assume that undisturbed water saturation in the Weir sand at the start of water flooding is around 36 to 40 per cent.

Completion practices . . . All of the operators are cementing 2-in. high-pressure tubing in the water intake wells, and removing the 7-in. casing which was in place for the drilling, shooting, and cleaning out. The sand is shot with nitroglycerin, and shell sizes vary between 1½ and 4 qt. per ft. The smaller size shots will give less cleaning-out time. Almost no 10-in. casing is used in completing the wells as 8 or 8¼-in. surface set-in pipe is commonly used. A 7-in. o.d. casing string is run after the water-bearing salt sand has been penetrated.

Casing depths vary from 700 to 900 ft.

TABLE 1—AVERAGE CORE DATA BY PROPERTIES

Property—	Number of cores	Sand thickness	Per cent porosity	Permeability, md.
Lease 1	25	26.0	18.0	7.5
Lease 2	24	28.5	18.3	13.0
Lease 3	27	27.7	19.2	8.2
Lease 4	7	22.0	17.8	6.5
Lease 5	15	24.0	21.0	12.6
Lease 6	7	21.0	20.5	13.3
Lease 7	7	15.6	20.4	17.5
Lease 8	10	13.6	21.7	20.2
Lease 9	17	26.6	18.5	8.7
Lease 10	20	26.5	17.6	7.3
Lease 11	10	25.5	17.0	3.6
Total and averages	*169	†24.9	†18.9	†9.9

*Actual number of cores = 144. Intermediate boundary-line cores used for two or more properties. †Average weighted by number of cores.

TABLE 2—ANALYSIS OF CORES TAKEN WITH WATER AND OIL AS CIRCULATION FLUID

Core number—	Core analysis averages— Per cent porosity	Permeability md.	Oil sat.	Water sat.
(Water coring)				
1A	20.2	4.6	13.9	46.9
2A	20.5	4.8	18.9	45.2
3A	22.9	11.9	18.8	43.5
4A	21.7	6.2	15.3	45.8
5A	23.9	9.9	16.6	43.8
6A	22.1	10.0	16.3	48.8
7A	20.1	6.2	15.7	43.0
8A	21.0	7.2	14.4	44.5
Average	21.6	7.6	16.2	45.2
(Oil coring)				
1B	25.1	10.7	32.9	38.8
2B	24.8	10.6	35.7	39.7
3B	23.6	14.7	30.6	40.4
4B	23.0	7.8	26.2	45.6
5B	18.9	2.3	28.8	33.4
6B	19.6	1.9	26.5	38.0
7B	19.5	2.1	27.5	37.5
Average	22.1	7.2	29.7	39.1

TABLE 3—ANALYSIS OF FLOODING WATER

	Green Rice pressure plant— Raw water	Filtered water	Intake well 26
Appearance when sampled	Hazy	Clear	Clear
Appearance after standing	Hazy	Clear	Clear
Odor	No	No	No
Taste	No	No	No
Temperature, °F.	55.0	54.0	52.0
pH	7.1	8.8	8.8
Carbon dioxide, p.p.m.	26.0	0.0	0.0
Dissolved, oxygen p.p.m.	0.0	0.3	0.3
Residual chlorine, p.p.m.	N.D.	0.15	0.05
Color	3.0	1.0	0.0
Turbidity, p.p.m.	12.0	0.6	0.6
Sulfates, p.p.m.	0.0	0.0	0.0
Manganese, p.p.m.	0.0	0.0	0.0
Iron total, p.p.m.	1.3	0.03	0.15
Alkalinity to phenolphthalein, p.p.m.	0.0	30.0	32.0
Alkalinity to methyl orange, p.p.m.	164.0	204.0	202.0
Chlorides, p.p.m.	28.0	31.0	30.0
Soap hardness, p.p.m.	130.0	124.0	122.0
Silica, p.p.m.		12.0	
Calcium, p.p.m.		33.0	
Magnesium, p.p.m.		10.0	
Complex phosphate, p.p.m.		2.8	3.1

The oil wells are drilled, shot, and cleaned out in the same manner as the water wells and are either pumped with central powers existing on the property, or with new individual electric units. It is necessary to leave casing in place in the producing wells.

Water supply and injection . . . Table 3 gives an anlysis of flooding water. The water supply is obtained from salt-sand wells at 450-600 ft. New wells are generally drilled for this purpose. In some cases old wells have been abandoned and converted to water-supply wells in the salt sand.

The writer believes that the salt sand contains a very adequate water reserve and supply for water flooding the Weir sand. It appears necessary that the water supply wells should be spread over a substantial area so that a large water-flood area is not served from water-supply wells concentrated in one section.

Water injection rates are low, due to the low permeability and pressure limitations of this depth and the sharp decline in early injection rates. Pressures in general use are 650-850 psig. Water-injection rates range from 0.5 to 0.25 bbl. per acre-foot per day. These low injection rates, however, do not seem to prevent satisfactory oil-output rates and economics of close well spacing may be questioned.

Lease data . . . Fig. 7 shows oil production and water injection for the P Caudill property. This lease appears to be near its peak with present oil production of some 300 bbl. per day. The water production is insignificant, averaging only 10 to 14 bbl. per day.

Water was introduced in June 1953 and 2½ to 3 years were required for peak oil production.

Fig. 8 is a cumulative curve of this same property. Approximately 130,000 bbl. of oil have been produced with a net water injection of less than 500,000 bbl. The ratio of water injected to oil produced at the present is about 3.7 bbl. of net water injection for each barrel of oil produced and the current ratio is approximately 1.4 bbl. of water per barrel of oil produced. These ratios indicate a very efficient flood with a minimum of water bypassing or wastage.

Fig. 9 shows oil and water production and net water injection on the P. Borders property. This property apparently reached its peak oil production at the end of 1955 after 20 months of water injection. The peak production was unusually high—9.5 bbl. per acre per day. The net water injection has declined sharply and at this point it is not known to what degree this decline is caused by mechanical fillup as contrasted with other causes. The cumulative ratio to date is 3.4 bbl. of net water injection per barrel of oil produced. The current ratio is 1.4 bbl. of net water injection for 1 bbl. of daily oil production. This property has reached a water cut of 16 per cent which does not seem excessive in comparison with the water-flood oil production to date of 3,500 bbl. per acre.

Fig. 10 is for the P. Borders property. The relationship of cumulative oil production and the cumulative water injection appears favorable.

SCENE: BUTLER AND GREENWOOD COUNTIES, KANSAS, WHERE

Water Flooding Pays Off For Two Companies

by Jack P. Powell

Part 1 of a Series

1. Cities Service Oil Co.

THE El Dorado Shallow sand waterflooding project of the Cities Service Oil Co. in El Dorado field, Butler County, Kansas, produces from the locally designated 660-ft. sand.

The thickness ranges from 10-20 ft. Core analyses show the porosity is high—about 29 to 30 per cent with the permeability varying between 150 and 1,500 md. The operator has estimated that the average oil saturation of the sand before flooding was about 30 per cent and the average water saturation about 50 per cent.

History before flooding . . . The shallow 660-ft. sand was the first formation to produce oil in El Dorado field. The discovery well was drilled in September 1915 and it still is producing oil. Recovery by primary methods from the 4,985 producing acres included in the water-flood project is calculated to be about 14.5 million barrels of oil. This is equivalent to 2,910 bbl. of oil per productive acre.

In 1924-25, a pilot air-drive test was tried. Good results were obtained so a full-scale air-drive operation was begun in 1926 which, when fully developed, included 110 air-injection wells that affected about 500 oil wells. Later the project was expanded gradually and about 770 oil wells were affected. The air drive was continued on each lease until 1954 when the lease was converted to water flooding.

About 12.2 million barrels of oil was recovered by the air drive plus the 14.5 million barrels of oil recovered by primary methods. The recovery by air drive amounted to 2,460 bbl. of oil per acre, bringing the total recovery before water injection to 5,370 bbl. per acre.

Author is petroleum engineer, U. S. Bureau of Mines, Bartlesville, Okla. Data from USBM information circular.

PRODUCING

Development of Water Flood

A pilot water flood was begun on the Hegberg lease in 1937, using fresh water purchased from El Dorado. A coagulant was added to the water, and it was filtered before being injected. Even though the operation was small initially, water was injected at the rate of about 200 bbl. per day at wellhead pressure of 50 psi. However within 60 days the rate had declined to 100 bbl. daily at 600 psi.

A packer leak then developed and while the well was being reconditioned, injection into a second well was begun. Although water was injected into these two wells for several months, no increase in the oil-production rate was obtained, and the test was abandoned in March 1939. A total of 190,000 bbl. of water was injected. Failure of the test is attributed to the swelling

of clays in the sand in contact with fresh water.

In 1947 a second pilot test was begun on the Pierpont lease. Four new input wells were drilled between existing wells, so the spacing of input wells was about six acres per well. These wells were drilled with a rotary, and 4½-in. casing was set and cemented at the top of the sand.

The sand in each well was shot with 5 to 10 qt. of nitroglycerin. The holes were then cleaned out with cable tools. A packer on cement-lined tubing was set in the bottom joint of casing in each well. The surface equipment consisted of a corrosion-resistant meter and flow valve.

Water for this test was obtained from a well producing both oil and water from the Arbuckle limestone formation. After being separated from the oil in the gun barrel, the water was handled in a closed system without chemical treatment. The input wells took the brine at a reasonable rate and pressure, and within 6 months an increase in the rate of oil production from surrounding wells was noticed.

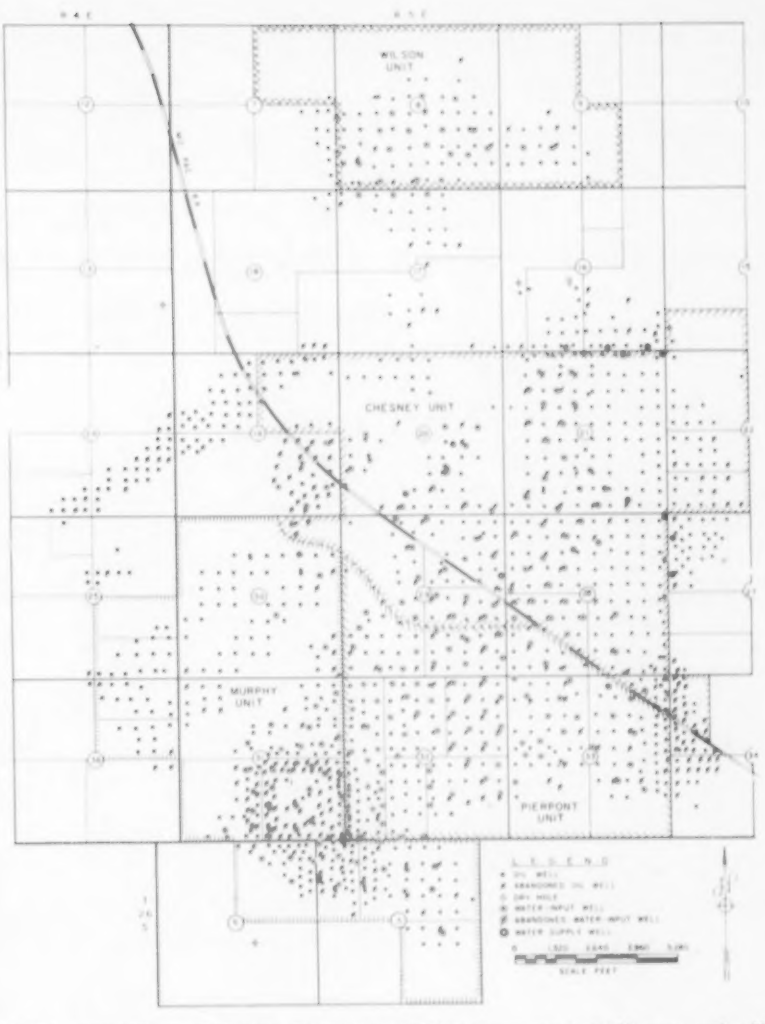
The rate of production from the oil well in the center of the project increased to 30 bbl. per day while oil wells adjacent to the pattern increased from a normal rate of 1 to 7 or 8 bbl. per day.

Flood expanded . . . When the successfulness of the pilot project became apparent six new injection wells were added to the project. There was little further development for about 3 years but since 1950 the project has been expanded rapidly. By the end of 1955 nearly 4,000 acres was included in the project, with development still in progress. Over 200 input wells were affecting 448 producing wells and the daily rate of oil production from the flood project exceeded 4,600 bbl.

During development of the project the field was divided into several operating units, and a water-treating and pumping plant was constructed to serve each unit. The Pierpont plant, the first one built, was expended in 1948, the Chesney plant was put into operation in April 1953, and the Wilson plant was activated in February 1954. A plant on the Murphy unit went into operation early in 1956.

Results of Flooding

To January 1, 1956, about 2.5 million barrels of additional oil, equivalent to 648 bbl. per acre, was recovered by water flooding in El Dorado Shallow field. Over 30 million barrels of water has been injected, giving a water-injected oil-produced ratio of 12:1. Development of the project has been rapid and by January 1, 1956, about 3,850 acres was included in the flooded area.



CITIES SERVICE EL DORADO SHALLOW FLOOD covers nearly 5,000 acres and will recover about 4.8 million barrels of oil, or 1,000 bbl. per acre. Fig. 1.

Ultimate yield as a result of water flooding is expected to be about 4.8 million barrels of additional oil, or 1,000 bbl. per acre.

Summary of operations, Cities Service Oil Co., Shallow sand project:

Location—T. 25 S., R. 5 E. and parts of T. 25 S., R. 4 E., and T. 26 S., R. 5 E.

Sand flooded—El Dorado shallow.

Depth to top of sand—660 ft.

Average sand thickness—10 ft.

Productive area—4,985 acres.

Area flooded—3,850 acres.

Well pattern—five spot irregular.

Type of water—brine.

Type of system—open.

First injection—August 1947.

First oil increase—December 1947.

Status—active.

Gravity of oil—36.9° A.P.I.

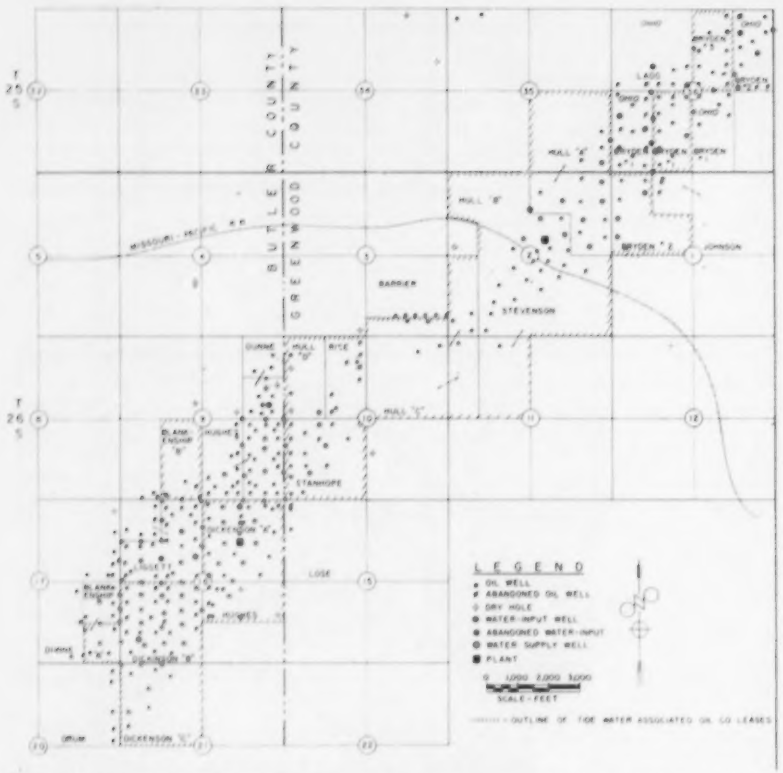
Viscosity of oil—4.3 cp. at 100° F.

2. Tidewater Oil Co.

IN March 1949, Tidewater Oil Co. began injecting water into wells on its Dickenson lease pilot project in Blankenship-Sallyards pool, Butler County, Kansas. When the pilot flood proved successful, the project was expanded and now includes about 800 acres in 13 leases.

The original pilot flood was located near the south end of the leases but drilling and development commitments made it necessary to initiate water flooding on the north end as illustrated in Fig. 2. Eventually all of the leases shown on the map will be flooded.

The pay formation is the Bartles-



TIDEWATER BLANKENSHIP FLOOD includes 800 acres which have yielded over 2,000 bbl. per acre as a result of water flooding. Fig. 2.

ANALYSIS OF 27 GREENWOOD COUNTY, KANSAS, BARTLESVILLE SAND WATER-FLOOD PROJECTS

(Preliminary data by A.P.I.-Tulsa Study Committee)

Project size*	Primary recovery		Secondary recovery to date		Future recovery by water flooding	
	Bbl. per acre	Bbl. per acre-ft.	Bbl. per acre	Bbl. per acre-ft.	Bbl. per acre	Bbl. per acre-ft.
B	4,800	104	7,000	148	80	2
B	6,600	193	1,850	54	0	0
D	4,750	118	4,870	120	110	2
B	6,070	168	5,300	148	1,030	29
B	5,450	116	4,900	104	1,650	35
C	3,960	158	5,892	256	500	20
B	2,236	106	1,702	81	630	30
B	4,100	165	1,314	53	0	0
C	4,870	182	5,000	161	620	20
C	5,952	152	4,000	102	780	20
B	9,928	292	4,000	118	500	15
C	8,874	261	4,460	139	540	17
A			2,700	79	800	24
A			2,700	90	300	10
B	3,270	109	2,400	60	1,100	28
B	6,720	168	720	16	3,780	84
B	8,850	177			4,500	90
B	7,480	187	1,220	30	3,280	82
E	4,255	163	7,734	204	782	21
E	7,307	152	7,508	134	5,792	105
D	7,312	209	6,652	190	350	10
F	9,250	185	830	17	5,070	101
C	8,526	224	9,143	189	0	0
A	4,459	203	6,440	293	0	0
D	6,987	165	1,730	41	115	3
C	5,405	151	4,339	121	933	26
D	6,400	194	6,359	193	277	8

*Size of water-flood project: A. Less than 2,500 acre-ft. B. 2,500 to 5,000 acre-ft. C. 5,000 to 10,000 acre-ft. D. 10,000 to 25,000 acre-ft. E. 25,000 to 50,000 acre-ft. F. 50,000 to 100,000 acre-ft. G. Over 100,000 acre-ft.

ville sand, at a depth of 2,450 ft. It has an average thickness of 36 ft. The porosity ranges from 17 to 19 per cent and the permeability from 0 to 180 md. Gravity of the oil is 38° A.P.I.

History before flooding . . . The discovery well was completed on August 16, 1917, as a flowing well. After field development in 1924, vacuum was applied to most of the wells to stimulate the rate of production, and this was continued until water injection was begun.

Well completion . . . The water input wells are drilled with rotary-drilling equipment. A 7⅞-in. hole is drilled to the top of the sand then a 4⅞-in. hole is cored and reamed to bottom. If a core is not taken an electric log is obtained. Then a string of 4½-in. pipe is set and cemented with 100 sacks of cement, using a triplex float shoe. The cement plug then is drilled out and the sand face is washed.

If the well cleans up readily, only water is used to clean the sand face. If not, approximately 50 gal. of mud acid is used and washing is continued until the sand face is thoroughly clean, as evidenced by the return of clear water. These input wells are neither shot nor fractured. New producing wells are drilled and completed just as the input wells, except 5½-in. casing is used.

The recovery before water injection slightly exceeded 3,600 bbl. of oil per acre, and water flooding has resulted in the recovery of about 1,650,000 bbl. of oil or slightly over 2,000 bbl. per acre from the 800 acres flooded.

The cumulative water-injected to oil-produced ratio is only 7. A new peak rate in production is anticipated in 1956 from the extension of the project in 1955. The ultimate recovery per acre by water flooding will equal the recovery before water injection.

BOOK

A.S.T.M. STANDARDS ON METALLIC ELECTRICAL CONDUCTORS. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3. 300 pp., $3.50.

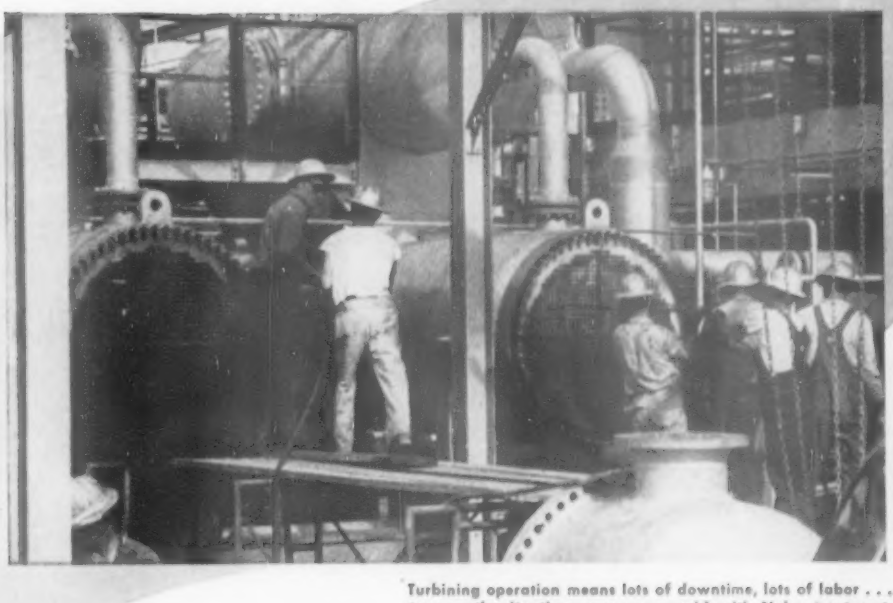
The A.S.T.M. standards pertaining to metallic electrical conductors, which were developed by A.S.T.M. Committee B-1 on Wires for Electrical Conductors, and related standards from other committees of the A.S.T.M. have been compiled in compact, readily usable form.

Standards cover: (1) Copper, copper alloy, and copper-covered steel, wire, stranded conductors, rods, bars and shapes, pipes and tubes; (2) aluminum; wire, stranded conductors, rods and bars; and (3) galvanized-steel-core wire, and galvanized iron and steel guy, messenger, span, overhead ground, and line wire.

Twenty of the specifications have been revised and one of the standards is new since the previous edition.

Nalco TREATMENTS

can prevent plugging, put an end to costly turbining of heat exchanger tubes



Turbining operation means lots of downtime, lots of labor . . . two costly situations you can avoid with Nalco treatment.

WATER side plugging of heat exchanger tubes is an expensive nuisance Nalco has licked . . . and not on a *just-as-good* or *just-as-cheap* basis. Nalco treatment *often ends completely* the need for mechanical cleaning to remove sludge, scale, slime and corrosion products.

If plugged tubes plague your heat exchangers you can count on Nalco for substantial time and money savings. The Nalco System prevents sludge, scale, slime and corrosion...with chemicals and feeding procedures fitted exactly to your need by specialists in the water treating field.

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By simplifying and expediting studies . . .

Radioisotopes Help Solve Refinery Problems

Part 1 of a four-part series.

Esso Standard Oil Co. has used radioisotopes on three different occasions at its refinery in Baltimore. To compare mixing efficiencies of two reactors total test period was only 3 days. Using a small dosage (15-millicurie) insured safety of personnel.

by George Weber
Refining Editor

RADIOISOTOPES are proving useful in a variety of ways in petroleum refineries. In three particular applications at Esso Standard Oil Co.'s Baltimore refinery, they have simplified and expedited studies of processing units.

Alkylation efficiency . . . The first project was one involving a direct comparison of the mixing efficiency in two sulfuric alkylation reactors. The zones under study were located between two baffle plates in the lower section of the two reactors, as shown in Fig. 1.

Seven different sampling points were provided, four near the shell of the vessel, and three at the center. Continuous samples were withdrawn simultaneously from two selected points by means of small rotary pumps. The samples were withdrawn past a scintillation counter at a high flow rate and were returned to the vessel directly beneath the top feed inlet.

A rate meter and recorder gave continuous readings of the gamma radiation of the sample passing the scintillation counter.

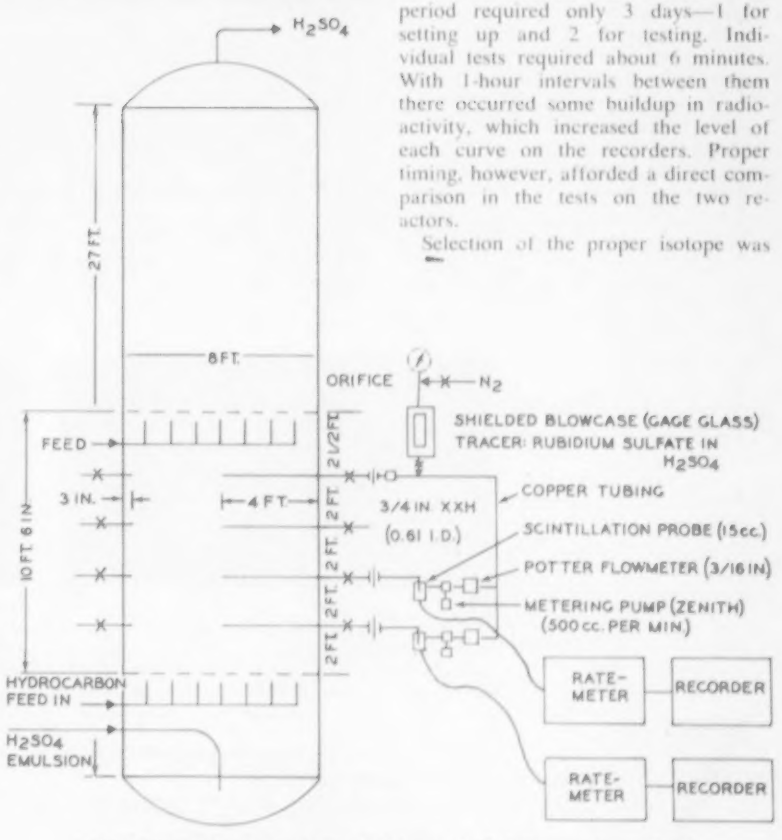
The radioisotope tracer was contained in a shielded blowcase equipped with a gage glass. An actual test required only 6 minutes, and four men. One operator injected the tracer into the return line to the reactor, while two other operators took posts at the two recorders. The fourth man acted as timekeeper. At his signal the recorders were marked at time zero and the tracer was injected.

As the minute quantity of radioactive tracer entered the vessel at the top of the mixing zone, it went into solution in the sulfuric acid and followed the turbulent acid flow pattern in the mixing zone. The amount of this dissolved tracer which migrated to the selected sampling zones gave a direct indication of the reverse flow within the mixing zone.

Reproducible results . . . The buildup in radioactivity in the two continuous samples showed good reproducible results on all tests. The curves on the recorders rose uniformly to a peak in about 2 minutes and then tapered off gradually. These charts afforded a direct comparison of the mixing efficiencies in the two reactors at the selected levels and furnished a quick and accurate measure of the mixing which was taking place in the respective zones.

At no time did the radioactivity of the acid even approach the danger level. The 15-millicurie dose injected to the reactor was so diluted in the samples that operators could have safely absorbed nearly 7 times as much radioactivity in 1 day, and 10 times as much in 1 week, as the maximum exposure experienced throughout the test period. Actually, the procedure was so brief and accurate that the total test period required only 3 days—1 for setting up and 2 for testing. Individual tests required about 6 minutes. With 1-hour intervals between them there occurred some buildup in radioactivity, which increased the level of each curve on the recorders. Proper timing, however, afforded a direct comparison in the tests on the two reactors.

Selection of the proper isotope was



EQUIPMENT SETUP for testing deficiency of alkylation reactors. Fig. 1.

JOHN WIGGINS' ANSWERS TO 8 QUESTIONS CAN HELP YOU SELECT A BETTER FLOATING ROOF SEAL

Are all floating roof seals the same? What about safety? Conservation? We asked John Wiggins, inventor of the floating roof and noted conservation authority, to answer questions most commonly asked about the new Wiggins Safety Seal.

1—**Q.** In the new Wiggins Safety Seal does any of the mechanism contact the liquid?

A. No. All metal working parts are out of the liquid away from corrosive vapors.

2—**Q.** Does the new "Weather Hood" provide longer fabric life?

A. Yes—the fabric is protected from the sun and other elements—lower temperature under the hood provides added conservation.

3—**Q.** In old style seals, rust and scale accumulate and shorten seal life. Does this happen with this seal?

A. The "Weather Hood" prevents rust and scale from depositing in the "seal loop"—thereby increasing seal life.

4—**Q.** Does the Wiggins Safety Seal prevent rim fires?

A. Yes—design of the seal virtually eliminates critical vapor spaces where air and vapor collect to form explosive mixtures. When exploded through controlled tests, the fabric was able to expand enough to contain the explosion without tearing.

5—**Q.** Is this seal safe for the storage of low vapor-pressure, low flash-point liquids such as jet fuels?

A. Yes, the design of the Wiggins Safety Seal reduces the danger area to a minimum so that it can be used in the storage of jet fuels with complete confidence.

6—**Q.** How does the Wiggins Safety Seal guarantee maximum protection against evaporation loss?

A. Air-vapor volume of the Safety Seal is less than 10% of the present volume for floating roof seals. This would eliminate most losses. In addition, the air-vapor space is shielded by a "Weather Hood". This area—the area that breathes—reduces losses to a minimum.

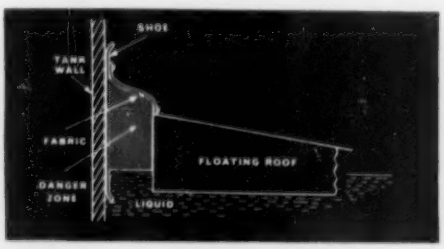
7—**Q.** Will the Wiggins Safety Seal save me money?

A. Yes—by eliminating losses due to thermal breathing, preventing rim fires, use of new longer-lived fabric, protecting the mechanism from liquid and corrosive vapors and permitting much longer periods of "in-service" operation.

8—**Q.** Why have you put so much emphasis on the seal?

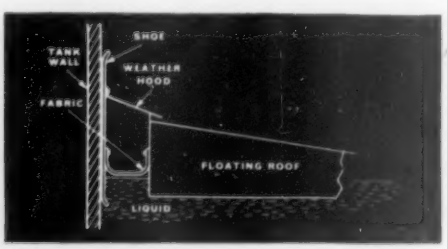
A. A floating roof is only as safe as its seal. With the new Wiggins Safety Seal, Wiggins floating roofs are in a class by themselves. Since General American makes all types of floating roofs, you can have the Wiggins Safety Seal on the roof that best meets your needs—whether it be the Wiggins Hidek*-Lodek* or Doubledek*.

*Patented



OLD

With the old type seal, the fabric is exposed to the sun's rays and explosive vapor collects in the large space between the liquid and the fabric; the mechanism is submerged in the liquid and exposed to corrosive vapors.



NEW

With the new Wiggins Safety Seal, vapor space under the circumferential fabric is reduced to a minimum. Ends spark fire hazards. Fabric is protected from the sun. Mechanism is out of liquid and corrosive vapor space.

To see why Wiggins Floating Roofs pay for themselves, write or call your General American sales engineer.

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GENERAL AMERICAN TRANSPORTATION CORPORATION

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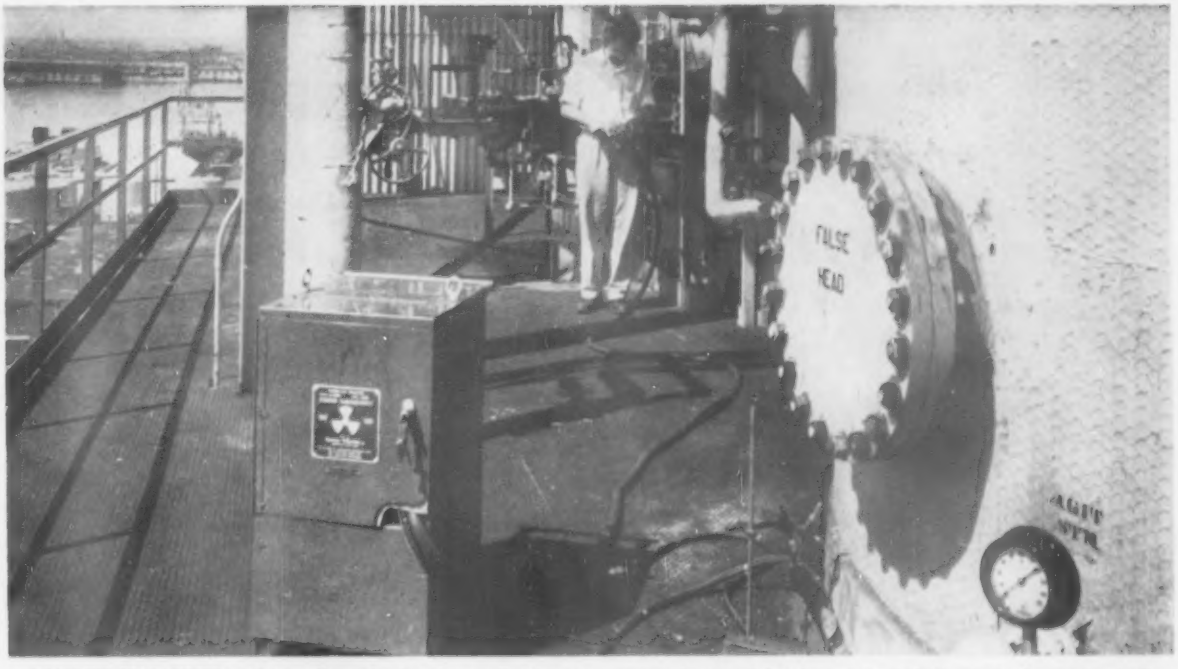


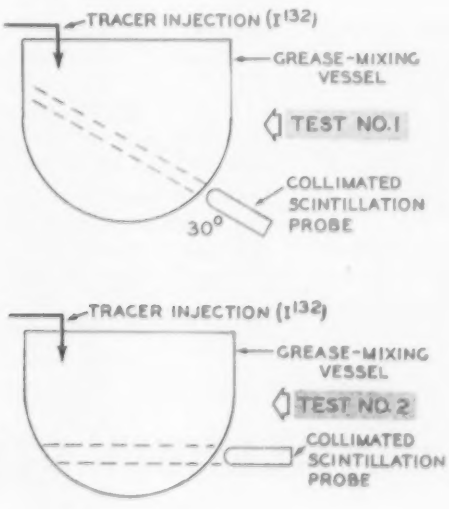
A COMMERCIAL UNIT used in radiography is being applied here to measure the top of the dense bed of fluid coke in the reactor in Esso Standard Oil Co.'s new fluid coking unit at Baltimore, Md. The Radiocobalt 60 source is brought to the end of the extension by the operator. When the test is finished, it is withdrawn by remote control to the lead box shown at left.

an important key to the success of this particular work. After reviewing all of the available tracers, Rubidium 86 was selected. This radioisotope has a half life of only 19½ days. This short life assured rapid decay and obviated any need to dispose of the acid used in the commercial operation.

An important factor which favored Rb^{86} was its exceedingly high acid solubility. Being soluble in acid only, it gave a direct reading on acid circulation throughout the zones tested. Further, its absence from the hydrocarbon product made unnecessary any holding period to permit the effect of radioactivity to decline before shipping product. A further advantage of Rb^{86} was its strong gamma radiation which made it easy to obtain accurate readings.

For this particular case, the selected isotope was the only one which filled all requirements. Its use permitted a rapid evaluation of the two reactors without interrupting commercial operation.

Nitrogen under pressure was employed to inject the sample into the system which was operating at about 200 psig.



EQUIPMENT arrangement for grease mixing vessels. **Fig. 2.**

Grease Studies

A second successful application of isotope tracer use took place in the grease plant. In this program the mixing efficiency of six different vessels was evaluated in 3 days.

Each vessel was tested for one product and runs were made at varying operating conditions and mixer speeds to determine optimum efficiency. The setup was very simple. The tracer sample was added to the top of the vessel and a scintillation probe was adjusted to a position outside the vessel to scan the desired zone. After trial-and-error tests, the best position was found to be at zero angle across the bottom section of the vessel, as shown in Fig. 2.

As the tracer became mixed with the grease, the radiation count on the recorder gradually built up to a constant level. The leveling-off point on the curve represented essentially complete mixing time, which could be compared for varying mixing conditions. Generally this took about 3 minutes and the test required no more than 7 minutes.

For this type of test, a radioisotope with a short life was desired since it remains in the product. But the tracers which decay rapidly also pose a problem in shipment and timing of tests.

Iodine 132 generator . . . The solution of this particular problem was found in the use of an Iodine 132 generator which was supplied by the **Brookhaven**

X2 Rods in Third Year of Service in Edison Field, in So. Calif.

In mid-March, 1954, the Burnett Company installed a 3400-ft string of Bethlehem X2 Sucker Rods in their Mark No. 1 Well, located in the busy Edison Field, near Bakersfield, California. The X2 string is now in its third year of trouble-free performance. The well, equipped with a Bethlehem 57DA-12 S pumping unit, is producing a steady 49 bpd of 21.4 gravity oil, pumped from Chenak sand.

If you are faced with medium pumping service in non-corrosive wells, or if your wells are properly inhibited, you can be sure of economical performance when you use the Bethlehem X2 rod. This rod provides good service because it is forged from top quality carbon-manganese steel, and is carefully normalized to provide uniform mechanical properties.

Besides the X2 rod, Bethlehem produces four other types of carbon and alloy rods, enabling you to meet practically every type of pumping condition efficiently and economically. If you would like to look into the best type of rod to meet a particular pumping condition, just get in touch with your Bethlehem sucker rod distributor. Or drop a line to the nearest Bethlehem sales office and we'll arrange to have a representative call, whenever you say.

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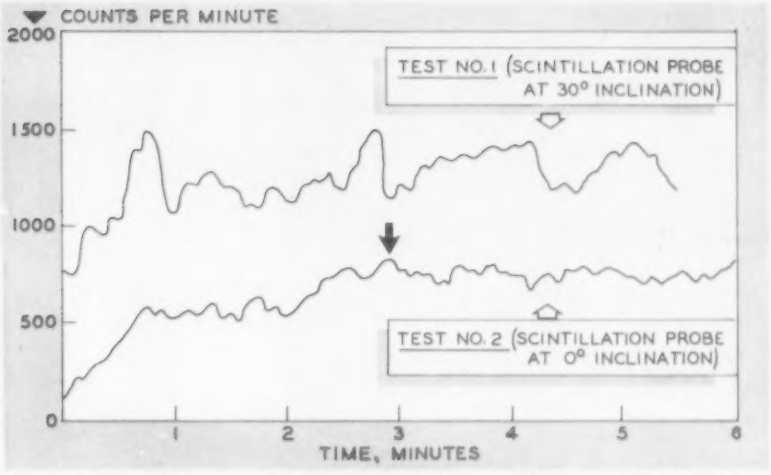

TYPICAL SCINTILLOMETER readings on grease mixing vessel efficiency tests, using Radioiodine 132 as a tracer. The two curves represent the results obtained from the corresponding tests shown in Fig. 2. The arrow in curve No. 2 shows the point at which complete mixing was obtained. Fig. 3.

National Laboratory on Long Island. This generator consists of a lead-shielded vessel containing Tellurium 132 with a half life of 77 hours. The vessel is fitted with a fritted glass filter through which sodium hydroxide is admitted. The radioactive tellurium goes into solution in the sodium hydroxide and acetic acid is added.

Tellurium is precipitated but radioactive Iodine 132, produced by the breakdown of the tellurium, remains in solution in the sodium acetate. This isotope has a short half life of only 2.3 hours. It gives strong gamma and beta radiation. The generator produces about 30 cc. of the iodine solution. It can be used effectively to produce radioiodine for about 2 weeks, which was more than adequate for the grease mixing tests.

Due to the rapid decay of the Iodine 132, it was possible to release all product after 48 hours, and most of it was ready for shipment within 24 hours.

The scintillation probe used in these tests has a moderately narrow collimation. It focused on a zone of about 1-in. diameter. This was desirable to obtain readings near the bottom of the vessels without picking up scatter radiation from elsewhere in the grease body. Original readings tilting the probe at 60° and even 35° proved inconclusive because almost instantaneous radioactivity was picked up from the tracer as it was introduced at the top of the vessel. Instead of a gradual buildup in radioactivity the operators obtained an initial peak which then leveled off (Fig. 2).

The sighting across the base of the vessel to include the grease in the bottom was considered superior, placing the probe in a horizontal position.

Fluid-Bed Measurements

The third project concerned studies of the new 10,000-bbl. per day fluid coking unit recently placed on stream at Esso's Baltimore refinery. These studies provided highly accurate measurement of the top of the dense phase of fluidized coke in both the reactor and burner vessels. They also permitted density studies in the dense phase of both vessels. These findings were then correlated with pressures, and pressure instruments were calibrated to give subsequent data on bed levels and densities by direct readings.

For this work a commercial panoramic projector purchased for radiographic work at the refinery was used. This device uses 370 millicuries of Cobalt 60 which has a half life of 5.3 years. The cobalt source is contained in a lead block located in the bottom third of the instrument (illustrated). A long tube shown in the background is used by the operator to withdraw the cobalt from the lead container and bring it to the end of the second extension—shown in the foreground.

The tip of this extension is first attached to the outside surface of the vessel at any selected point. The operator then retires to a safe distance and turns a crank which winds a cable, bringing the cobalt to within ⅛-in. of the tip of the attached extension. As a safety measure the cranking device in the operator's hand reads "safe" when the cobalt is in the lead block and "on" when it has reached the tip.

Accurate procedure . . . In measuring the top of the dense phase in the coker vessels the operators have worked out a procedure which gives rapid and very accurate readings. First, the radiation point is selected at a level known to be higher than the dense phase. The scintillation counter is then brought down the opposite side of the vessel.

As the operator scans the vessel he marks the point at which radiation begins to decline. This gives an approximate reading on the upper level of the dense phase where the greater density of the fluid coke in the vessel absorbs some of the radiation from the source of the opposite wall.

The cobalt is then withdrawn to the lead block and a second radiation point is located by survey 4 to 5 in. above the estimated bed level marked on the opposite side. The scanning procedure is then repeated. Since the lower angle of radiation across the top of the fluidized coke bed causes the strong gamma rays to pass through a comparatively thicker section of the dense bed as the scanning instrument is brought downward, a very sharp reading is obtained. The top of the dense phase can be measured accurately to plus or minus ½ in.

Bed density readings are measured by correlating radiation readings through various vessel levels with known values on the empty vessels.

This instrument can also be used to locate plugging and to measure flow of coke or fluid catalyst in large-diameter lines. For smaller lines an alternate source using only 10 millicuries is used. This can be safely handled on the end of a 3-ft. pole and is extremely mobile and easy to handle. The smaller device will be particularly well suited to spotting plugs in small or large lines on fluid units of any type.

"This instrument can also be used to locate plugging and to measure flow of coke or fluid catalyst in large-diameter lines. For smaller lines an alternate source using only 10 millicuries is used."

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Series 150 (Single-Bowl) Bowen Overshot fitted with Spiral-type Grapple and Grapple Control.

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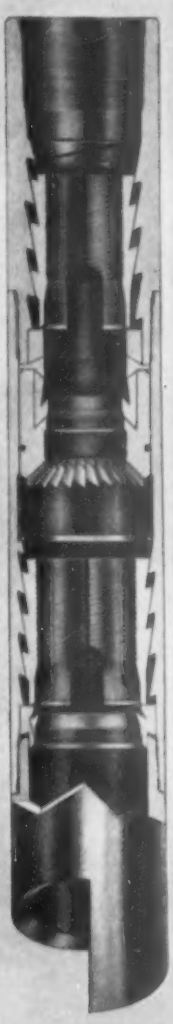

Series 200 (Two-Bowl) Bowen Overshot fitted with Basket-type Grapples and Grapple Controls.

BOWEN-ITCO • P. O. BOX 4587 • HOUSTON 13, TEXAS, U. S. A.

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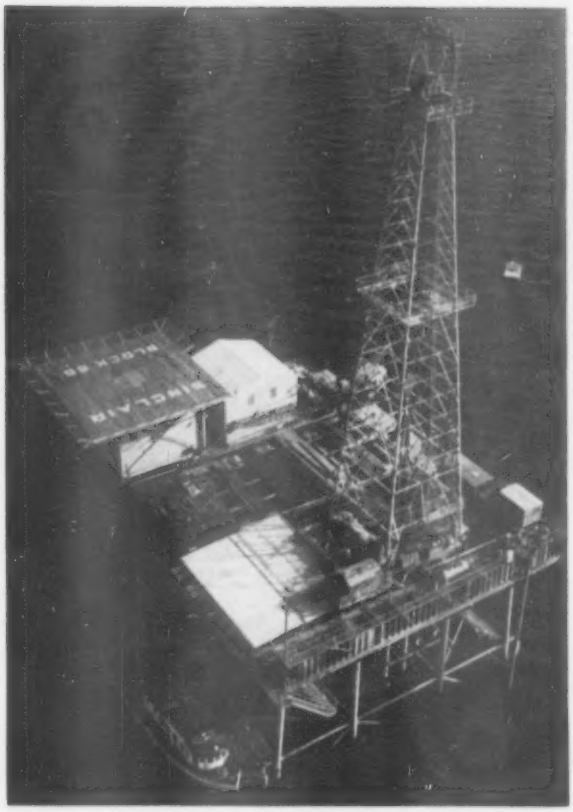
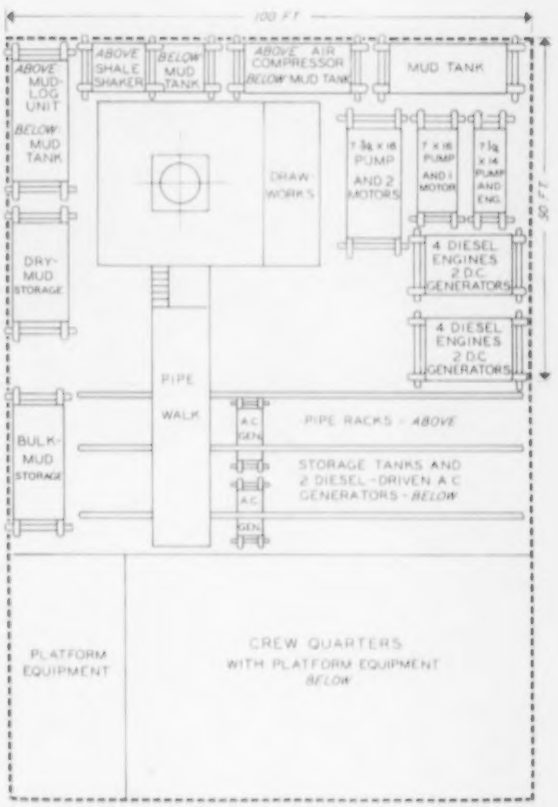


RIG 3 of Rimrock Tidelands is a diesel-electric designed especially for offshore drilling. Here it's drilling for Sinclair off the Louisiana coast. Fig. 1.



COMPACT LAYOUT permits drilling equipment to fit in a space 50 by 100 ft. Drilling equipment as well as pipe and materials storage occupies two levels. Fig. 2.

There's Real Space Economy Here

When drilling rigs put out to sea there's no room for frills. Rimrock Tidelands' Rig 3 is flexible, compact, and streamlined.

by Ed McGhee

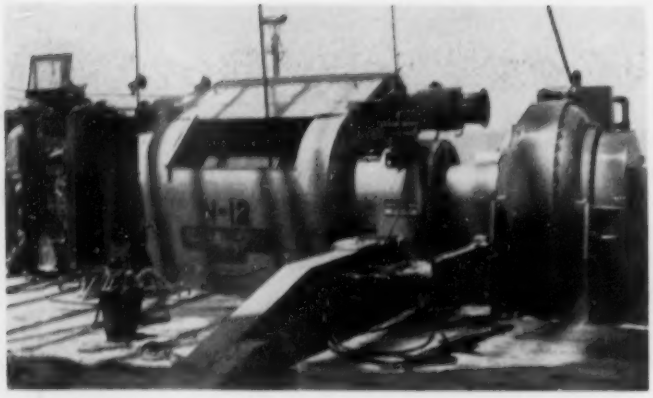
IN making the jump from land operations into offshore waters, drilling contractors have had to learn a lot about making their rigs fit new situations.

- First, they've had to package the equipment to take up the least possible space. Then, the contractors have had to design the rig elements so that they can be placed to best suit what little space is available.
- The equipment has to be flexible in operation so that costly down time is kept to a minimum. Rig 3 recently put into operation by Rimrock Tidelands, Inc., of Shreveport, has this needed compactness and flexibility. Some of its features could well be adopted on other rigs in both land and offshore operations.

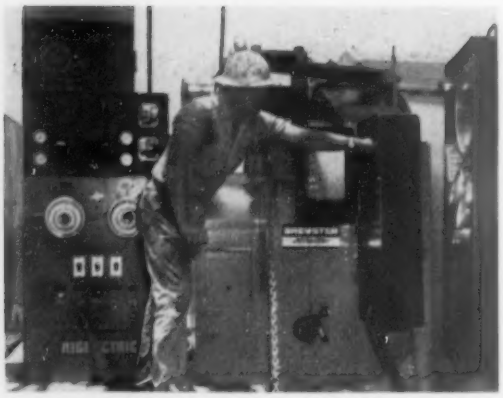
Fig. 1 is the platform of Sinclair Oil & Gas Co., in Block 86 in the South Timbalier area off the coast of Louisiana. Drilling from this structure is Rig 3 of Rimrock Tidelands, Inc., of Shreveport.

With the exception of pipe racks, water tanks, fuel tanks, and dry-mud storage, all usual rig equipment is placed in a space only about 100 ft. wide and 50 ft. deep. Fig. 2 shows how the various packages are arranged. The flexibility of arrangement that permitted such close placement is due mostly to adapting draw works and mud pumps to electric drive. New skid-mounted diesel-electric drive packages also aid in giving the rig compactness and flexibility.

Simplified controls . . . Fig. 3 shows the draw works and Fig. 4 is the driller's control panel. Note that the panel has been kept as simple as possible. Besides the usual cathead controls, it contains speed controls for the main mud pump, draw works, and indicating lights for the blowers on the various motors. It also contains emergency shutdown buttons for the rig, the light plant, and for total shutdown.



DRAW WORKS has two 625-hp. electric motors driving through a chain transmission. A feedoff control is mounted under the floor. Fig. 3.



CONTROL PANEL permits speed control of main equipment and contains emergency shutdown buttons for all equipment. Fig. 4.

The draw works is especially equipped for electric drive. It has a built-in 1,400-hp. two-speed-forward chain transmission, makeup and breakout catheads, and 60-in. hydromatic brake. It has a feedoff control mounted under the floor. The 27½-in. rotary is driven through a chain from the draw works. All clutches are air operated.

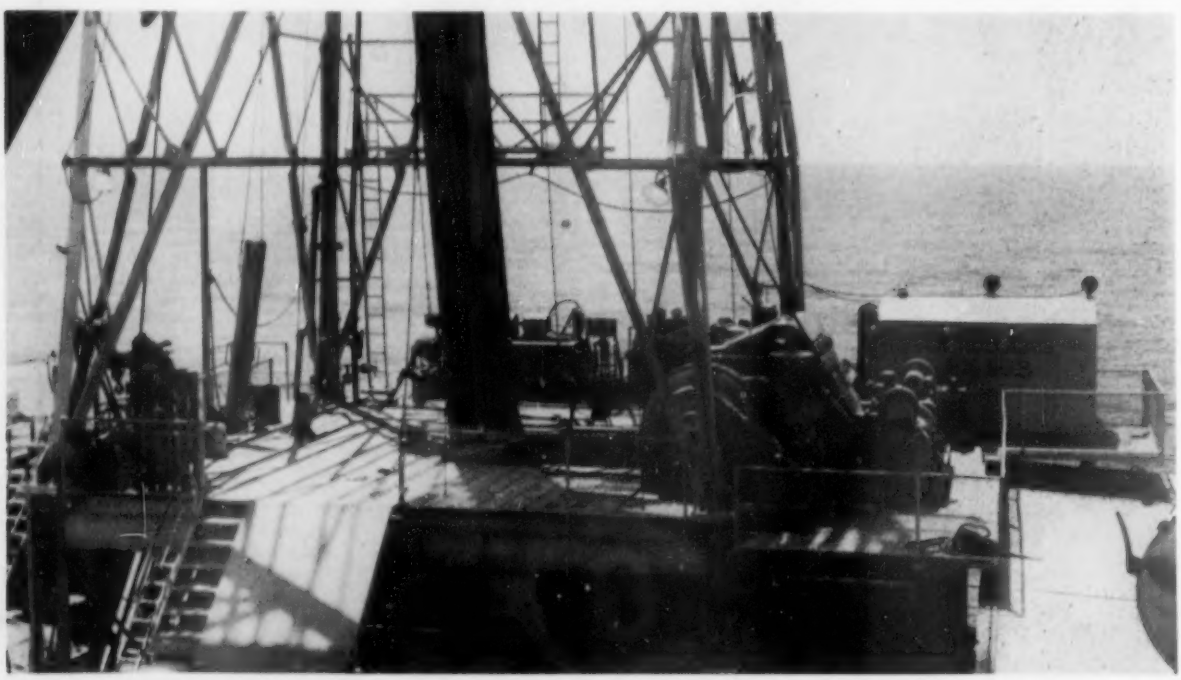
Two direct-current motors are mounted on the rear, each driving into the draw works unit through its own chain. Notice in Fig. 5 the compactness of the draw works and its drive. This equipment is mounted on a cantilever support off the substructure so that substructure, derrick, and draw works can easily skid intact from one location to another on the platform. Ease of movement is important since the platform must be used for drilling a minimum of eight wells.

The coring reel is independently powered and skid-mounted as a separate package with a diesel engine. The substructure is 30 ft. square and 14 ft. high; the derrick is 142 ft. high. The drilling line is 1¼-in. diameter, and the traveling and crown blocks are rated at 500 tons.

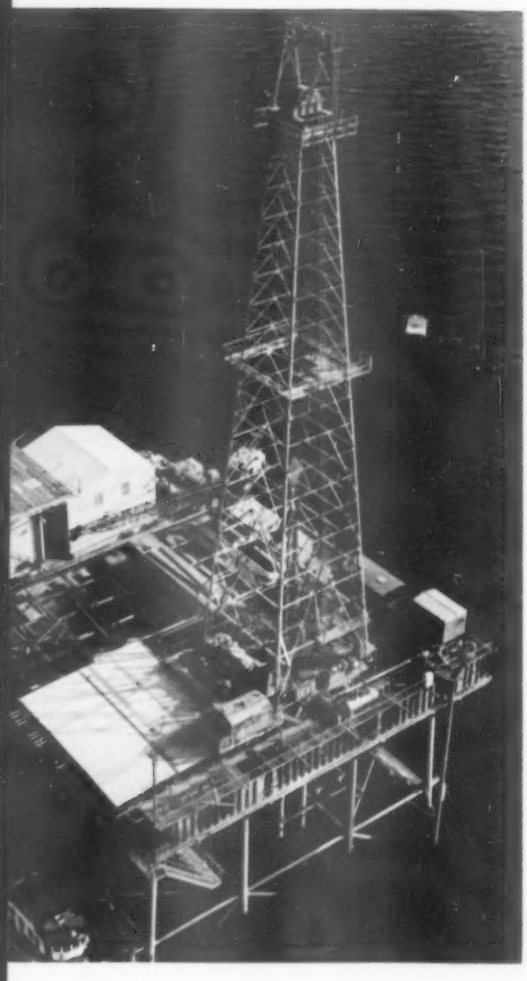
Generators, engines in line . . . Figs. 6 and 7 show the diesel-electric power packages. There are two of these skid-mounted units; each has two d.c. generators and four 250-hp. diesel engines. The two generators on each skid are mounted side by side with a motor in line on either end of each generator. Thus, the generators are driven from both ends and each skid mounts 24 cylinders yielding 1,000 hp.

There are several advantages to this type of power package. First, there is less chance of the rig being shut down by engine failure. If one engine goes down, the other engine of its set can drive its generator at part load. It's possible to put in a substitute engine if repairs are prolonged.

Control is much simpler than with bigger engines. Moreover, initial cost of the four-engine package is less than that of a large single engine of the same power. Another good feature of the smaller engines is that they can be



DRAW WORKS AND DRIVE take up little space on the rig floor. Equipment is mounted on a cantilever support off substructure. Fig. 5.



DESIGNED FOR THE JOB . . .

Offshore

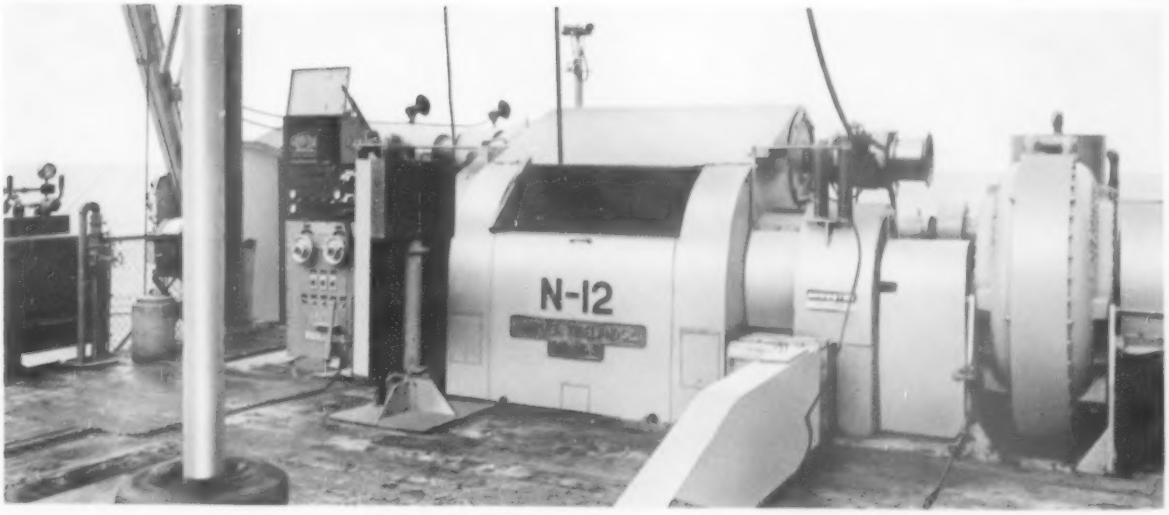
Brewster N-12 with Rigelectric

Here is a team that is winning the race for more speed and power on deep offshore wells . . . Brewster N-12 with Rigelectric Power.

Now at work in LaFourche Field, this Brewster built Rimrock Tidelands Rig 3 has the power and stamina to drill the worlds deepest well.

Working with Rigelectric equipment men, Brewster engineered the N-12 drawworks to obtain maximum advantage of diesel-electric power. At a touch of the controls the driller can put 1,250 horsepower at the drum to speed a long string of drill pipe off bottom. With equal ease he can direct 1,875 horsepower to the mud pumps . . . start or stop any auxiliary . . . all without effort, or leaving his position at the control panel.

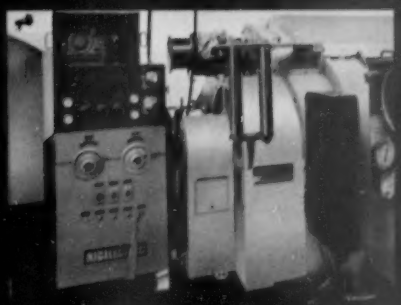
The smooth flow of full horsepower for every drilling task is bringing new speed and economy into the offshore picture. You can take advantage of this diesel-electric manufacturing experience by calling in Brewster when your new offshore venture is in the planning stage. Ask today for the Brewster N-12 Rigelectric offshore story . . .



BREWSTER N-12 DRAWWORKS

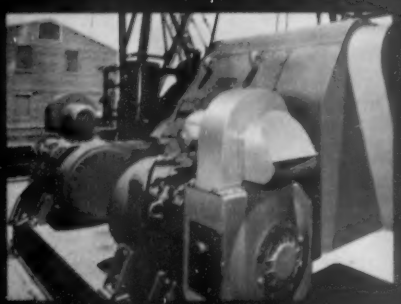
2000 HORSEPOWER AT THE DRILLER'S COMMAND

Amazingly simple the control panel for the N-12 electric rig gives the driller effortless command of every operation. His full attention can be concentrated on the job, which promotes greater crew safety and faster drilling.
Mounted as an integral part of the drawworks, the control panel need not be disconnected when moving the rig.



1250 HORSEPOWER AT THE DRAWWORKS

Designed for the job . . . the N-12 drawworks transmission is equipped with dual input drives each connected to a 625-hp. electric motor. The two-speed transmission, coupled with high and low drives at the drum, gives four hoisting ratios to supplement the infinite speed range possible with the electric motors. Short in length the drawworks package requires a minimum of deck room . . . can be skidded around to permit six or 12 well drilling.

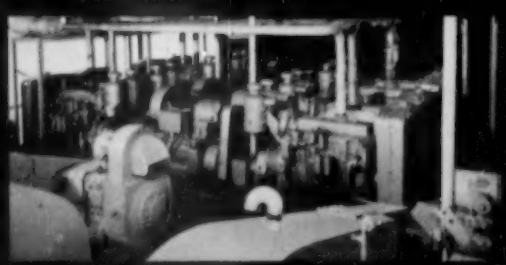


1875 HORSEPOWER AT THE MUD PUMPS

Flexibility of equipment placement is of major importance on space-limited offshore platforms. One 16-inch pump has been unitized completely with 625-hp. electric motor. One 18-inch pump has been unitized with 2 – 625-hp. electric motors. They can be skidded into the most favorable position for manifolding to the mud lines. Only an electric cable need be laid to obtain full driving power.

2000 HORSEPOWER AT THE GENERATORS

Completely packaged the Rigelectric generating units occupy a minimum of space . . . can be placed anywhere on the platform without regard to drawworks or pump location. Individually skidded as single units, the generator sets require only connection to fuel lines to go to work.



THE BREWSTER COMPANY, INC.
Shreveport, Louisiana

SUPPLY HOUSES

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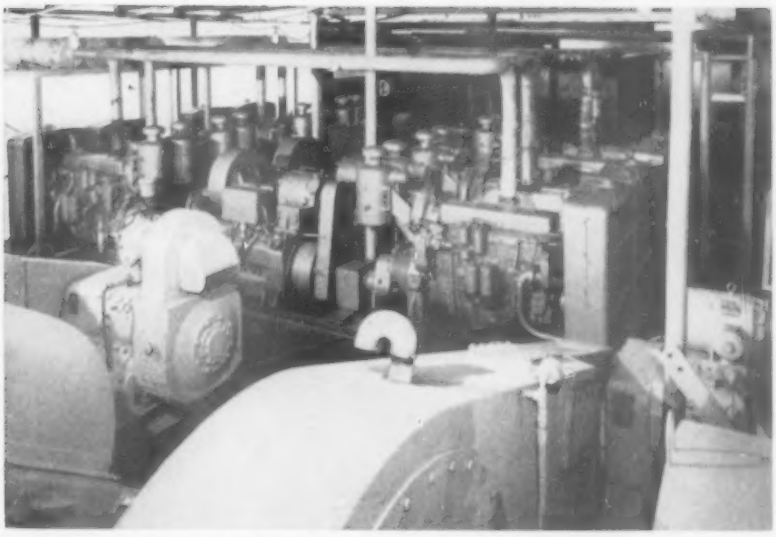
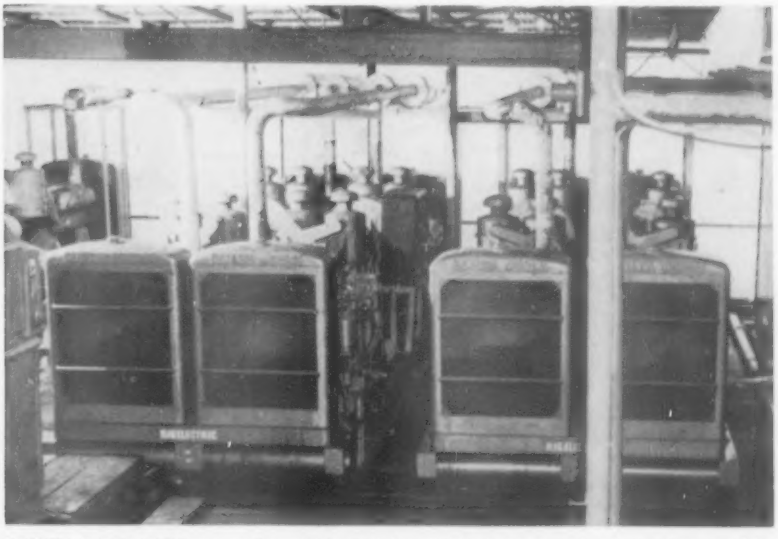
Murray Brooks, Inc.

United Supply and Manufacturing Company

For Canada, Mexico and Export Sales:
The Brewster Company



MAIN POWER SUPPLY is four 500-kw. d.c. generators driven by eight diesel engines. Fig. 6.



POWER PACKAGES mounted on skids contain a total of 1,000 engine horsepower to drive each set of two generators. Fig. 7.

reclaimed easily for other service if need be.

Fig. 8 shows how the power from the generators is used. Two of the generators are used only on the main mud pump. In normal drilling, the other two generators work together to supply power to the draw works; when the need arises, one of these can be taken off the draw works and put on the standby mud pump.

The generator armatures are identical to and interchangeable with those on the five motors. The motors themselves are interchangeable with each other.

Motor, engine-driven pumps . . . Figs. 9 and 10 show Rig 3's pumps. The main pump is a 7¾ by 18 in. driven by two of the 625-hp. d.c. motors; it is used on the hole at all times. The standby pump is a 7 by 16-in. driven by a single motor; it is used when the big pump is out of service or when both must be used together in parallel. Both are fitted with pulsation dampeners.

The third pump is a 7¼ by 14-in. unitized onto a skid with a diesel engine. This pump is used only for mud mixing.

For driving rig auxiliaries such as the shale shaker, air compressor, and the like, Rimrock Tidelands has two 100-kw. a.c. generating sets. These consist of a 250-hp. diesel engine mounted on a skid with a generator. The engines are the same as those driving the big d.c. generators. The a.c. power packages are shown in Fig. 11.

Three steel mud tanks are mounted across the platform as shown in Fig. 12. Above one of these is mounted the shale shaker; above another are two 5½ by 3 by 4-in. V-type two-stage air compressors. A fourth steel mud tank is mounted along one side of the platform and is used as a base for a mud-log unit.

Rig Equipment List

Brewster Model N-12A draw-works unit special equipped for electric-motor drive complete with built-in 1,400-hp. two-speed forward chain transmission, American Model 55 catheads and "60" Type "RC" single Parkersburg hydromatic brake. Draw works equipped with necessary skid and chain drive for mounting two 625-hp. d.c. electric motors.

Stewart & Stevenson diesel-electric power and drive group:

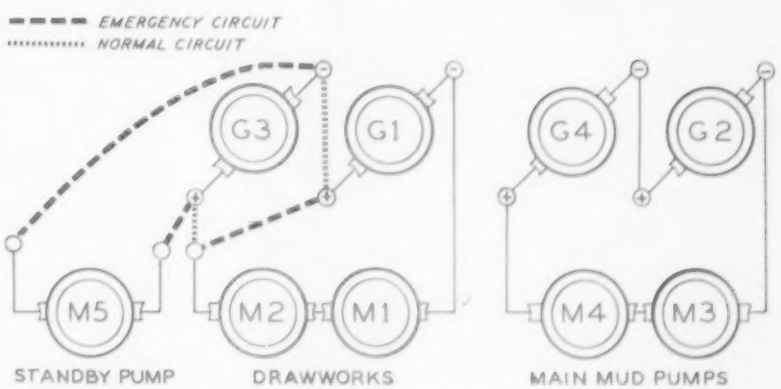
Rig electric drive consisting of two Model 24-1,000 diesel-electric power units each consisting of two GM 4-39G 500-kw. d.c. generators driven by four GM 6-110 diesel engines.

Five 625-hp. d.c. GM D-39M traction-type, electric-drive motors with cooling fans driven by 7½-hp. electric motor.

Two 100-kw. a.c. generator sets, 2-phase, 1,200 r.p.m., each unitized on steel skid with GM-110 diesel engine.

Rig lighting system for 142 in. drilling mast, Derrick Light & Equipment Co.

GR-GXR Gardner-Denver 7¾ by 18 in. power slush pump with K20 Hydril pulsation dampener and necessary skid and chain



GENERATOR COUPLING provides for two generators to run the main mud pumps and two to run the draw works or one on the draw works and one on the standby pump. Fig. 8.

drive for mounting two 625-hp. electric motors.

GR-GXR Gardner-Denver 7 by 16 in. power slush pump with K20 Hydril pulsation dampener and necessary skid and chain drive for mounting two 625 hp. electric motors.

FK-FXK Gardner-Denver 7¼ by 14 in. power slush pump complete and unitized with GM 62404 RA power unit.

Fourteen feet high by 30 ft. square derrick substructure.

Brewster HD-CB7-54 heavy-duty roller-bearing crown block, 500-ton capacity.

Brewster HD-6-54 heavy-duty-bearing streamline traveling block, 500-ton capacity.

One 450-ton Web Wilson Hydra Hook.

Brantley feedoff controller.

Ideco Model RS-275 long streamlined rotary table, 27½ in. maximum opening.

Eight inch Brewster Model 8-SX oil-bath swivel.

Byron-Jackson tongs, drill-pipe elevator, links, casing spider, and casing elevator.

One 5¼ in. by 41 ft. over-all American forged-steel upset hexagonal kelly.

One 3½ in. by 55 ft. U. S. Royal 4 rotary hose.

One 4 in. by 60 ft. Chicksan all-steel rotary hose.

Link-Belt Model No. 53, NRM-134D, dual hookup, shale shaker.

Two 1¼ in. by 5,000 ft. Hazard "Layset" 6 by 19 IPS IWRC rotary drilling line.

One ⅝ in. by 15,000 ft. RL IPS 6 by 7 galvanized PC bailing and coring line.

Martin Decker AWE-11 Type E indicating and recording weight indicator.

Fifteen thousand feet, 4½ in. o.d. 16.60 pound grade E range 2, National A.P.I. seamless black internal-upset drill pipe.

Five hundred and eight 4½ by 6 in. o.d. extra hole American flashweld tool joints complete, 18° taper.

Eleven 7¼ in. o.d. by 36 ft. long American drill collars.

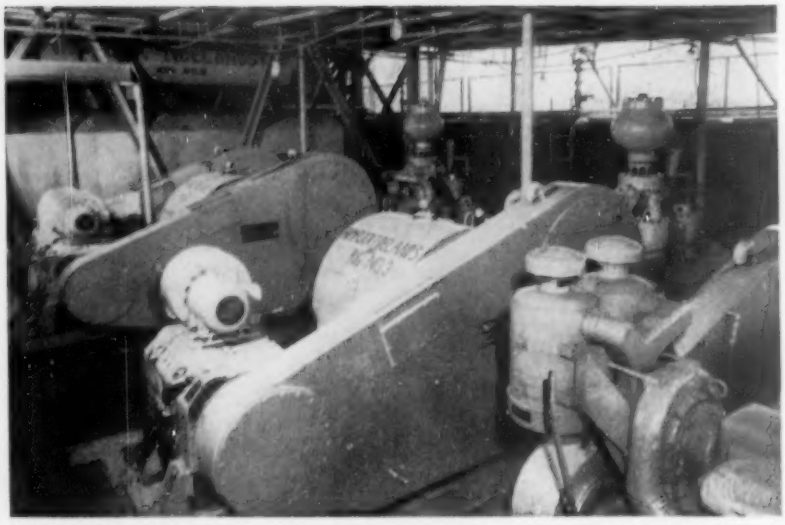
Hydril GK 10 in. nominal Series 1,500 blowout preventer.

Hydril Model HS-75-K 80 automatic pump accumulator unit, with 10-hp., a.c. electric motor.

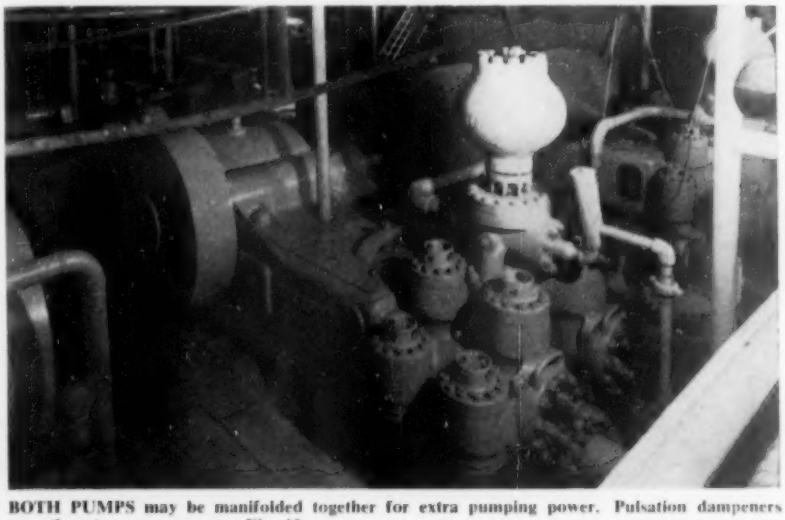
Ten inch Cameron blowout-preventer assembly complete.

Model F150 Brewster coring reel on skid frame, with 8041 Brown-Lipe transmission and powered by Model 6031 GM diesel engine.

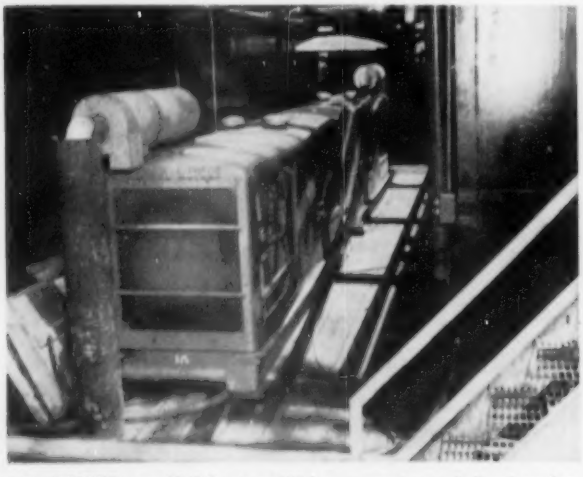
Two Gardner-Denver Model ADSA, size 5½ in. and 3 by 4 V-type, two-stage air compressors.



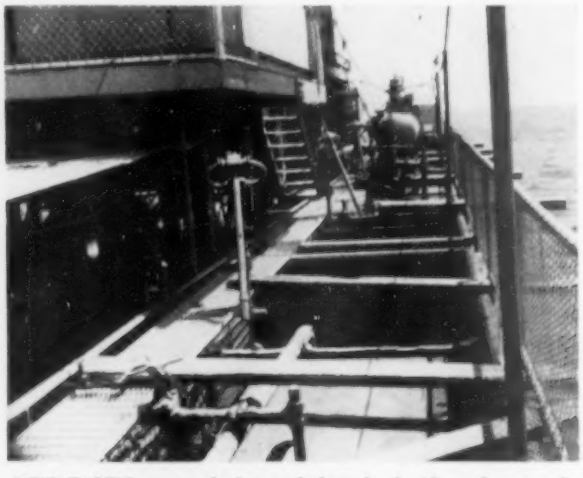
MAIN PUMP DRIVE is two 625-hp. d.c. motors while standby pump has a single 625-hp. motor. Fig. 9.



BOTH PUMPS may be manifolded together for extra pumping power. Pulsation dampeners smooth out pressure surges. Fig. 10.

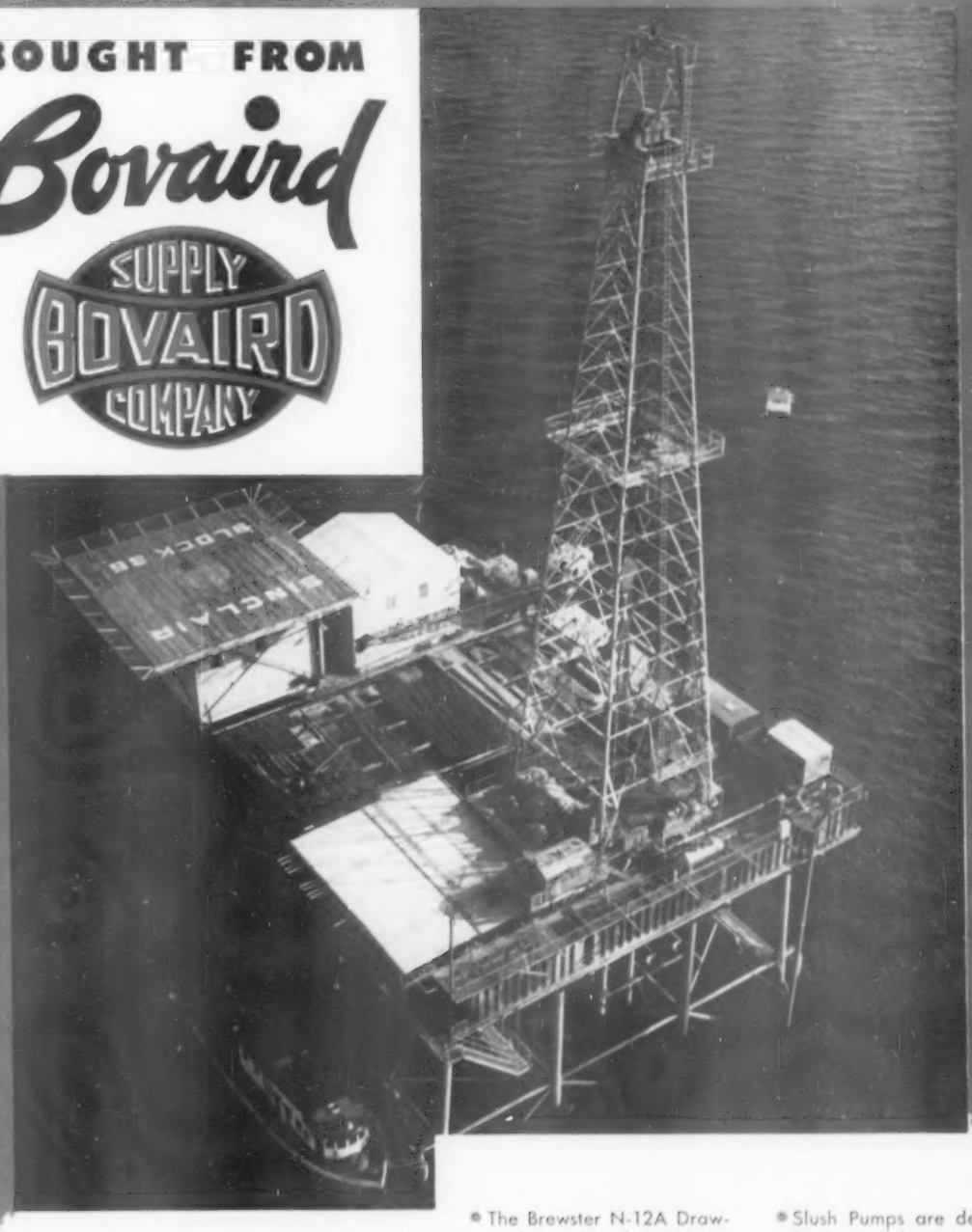


A.C. POWER provided by two 100-kw. generator and diesel engine sets drives rig auxiliaries. Fig. 11.



MUD TANKS occupy the lower platform level. Above these are the shale shaker and air compressors. Fig. 12.

BOUGHT FROM Bovaird SUPPLY COMPANY



We congratulate Rimrock-Tidelands, Inc., on their selection of equipment used to drill for Sinclair Oil & Gas Co. on the platform in Block 86 South Timbalier.

- The Brewster N-12A Drawworks combined with Stewart & Stevenson Rigelectric Equipment offers the very latest in power flexibility.
- Primary power for all operations is furnished by 12 Model 6-110 GM Diesel Engines combined with EM Generators and Motors.
- Slush Pumps are designed for a total horsepower input of 1800 mechanical H.P.
- Hoisting equipment of 500 ton capacity.
- All drilling equipment was purchased from The Bovaird Supply Company.

"Buy From Bovaird"

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GENERAL OFFICES
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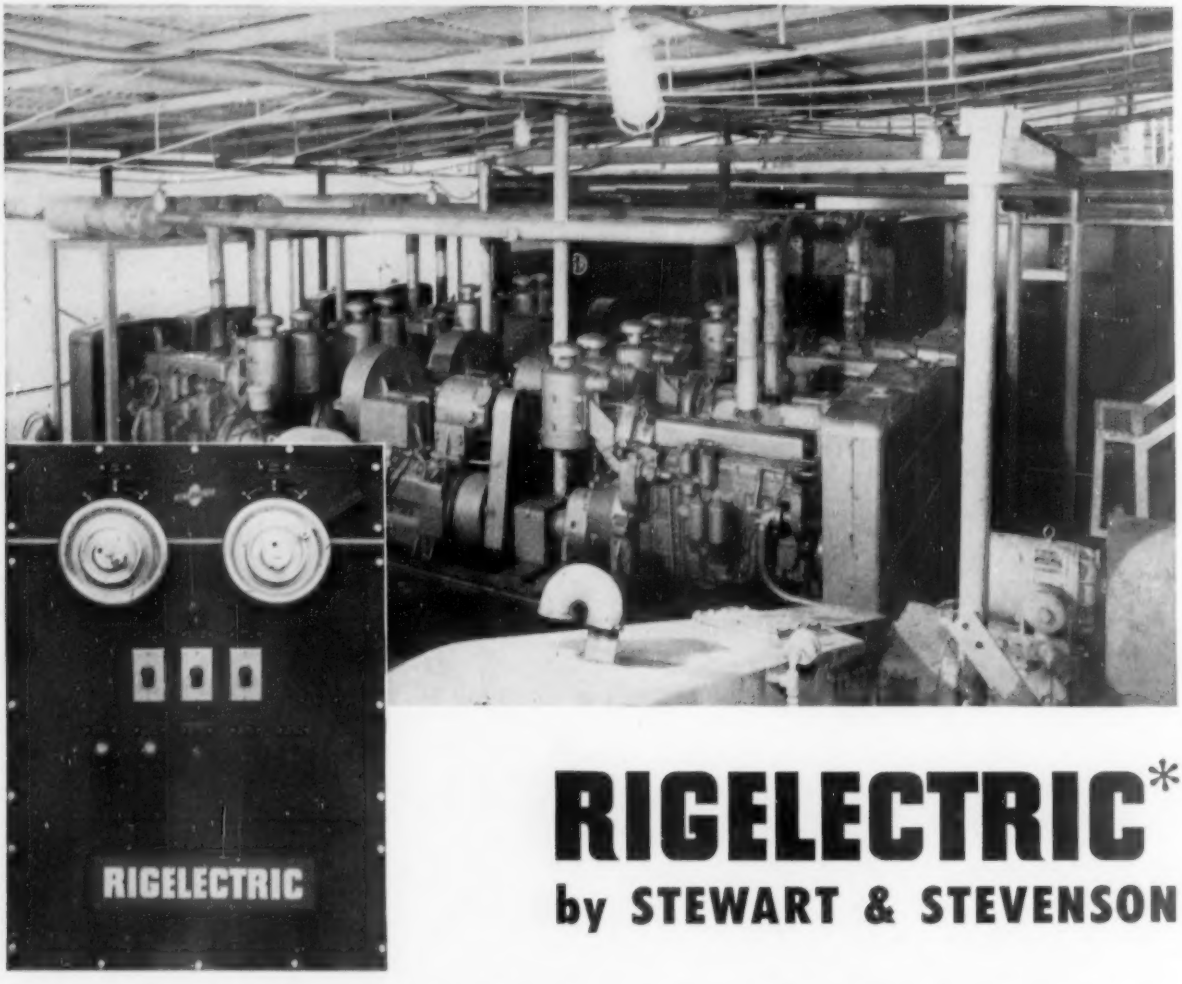
85 YEARS OF PROGRESS WITH THE OIL INDUSTRY

A NEW CONCEPT IN FLEXIBLE POWER FOR RIMROCK TIDELANDS



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Out in the Gulf, they're playing for keeps. And that's why Rimrock Tidelands, Inc. selected RIGELECTRIC. RIGELECTRIC is the newest and most flexible concept in diesel or gas engine electric drilling rig power, and besides that, RIGELECTRIC is backed by Stewart & Stevenson Service.

RIGELECTRIC, designed and engineered by Stewart & Stevenson, offers the maximum in dependability and reliability. The skid-mounted unit, which consists of two main generators and four General Motors 6-110 Diesel Engines, can operate in emergencies with one or more engines out of service. Other features included choice of fuel selection, simple controls and low cost maintenance and parts. And despite the flexibility and extra insurance provided by RIGELECTRIC, any mechanical equipment eventually must be repaired and serviced. And oil operators have learned from experience that the full and undivided parts and service responsibility of Stewart & Stevenson stands unconditionally behind every Stewart & Stevenson installation, day or night on land or water.

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STEWART & STEVENSON

THE NATION'S LARGEST DISTRIBUTORS OF GM DIESEL ENGINES

Panhandle Eastern uses digital computers to

Speed Gas-Compressor Performance Calculations

Here's how a modern computer can be used to calculate performance of compressor equipment and present that data in the form of curves for ready use by operating personnel. The operation is fast, accurate, and can cover a much greater range of variables than is feasible to do by hand methods.

by Dean P. Johnson and Fred E. Culvern

DURING the past few years, there has been considerable use of high-speed automatic calculating machines for making engineering calculations. These machines reduce the over-all time of calculation and allow an exploration of a greater range of variables in a given time. They also eliminate the drudgery of a long computation and also practically eliminate the human error.

This article presents one method of using an I.B.M. Model 604 computer to calculate performance data for gas compressors, and explains how data are presented in the form of curves.

The mathematical analysis, the data required by the tabulating section, and the curves which are drawn from the calculated results will be presented.

No attempt will be made to justify the formula used in the calculation of the horsepower required to compress gas or the formula used to calculate the capacity of a gas compressor. The formulas used do not make any specific correction for supercompressibility (deviation from Boyles law), but they have been found to be reasonably accurate when used in compressor calculations where the maximum discharge pressure is less than 1,000 psig. and when the compression ratio lies between 1.2 and 2.5. However, they can be used for ratios outside of these limits without incurring any serious errors. The horsepower formula used is a modified adiabatic form.

Authors are respectively engineer in engineering department, and senior engineer in research department, Panhandle Eastern Pipe Line Co., Kansas City, Mo.

Formulas Developed

The theoretical adiabatic horsepower formula is:

$$Hp = 0.08584\ (n/n-1)\ Q_o\ T_s \times (R^{(n-1)/n} - 1) \quad (1)$$

Where:

- n = ratio of specific heats C_p/C_v
- Q_o = M.M.c.f. per day at 14.73 psig. and 60° F.
- Q_s = M.M.c.f. per day at 14.73 psig. and suction temperature = Q_o when $T_s = 520$
- T_s = absolute temperature of gas at suction pressure, °R.
- R = compression ratio

To convert this to the form usually used in gas-compressor calculations, divide by $Q_o\ (T_s/520)$:

$$Hp/Q_s = 0.08584\ (520)\ (n/n-1) \times (R^{(n-1)/n} - 1) \quad (2)$$

This is the theoretical horsepower required to compress 1 M.M.c.f. of gas in 24 hours at 14.73 psia. and suction temperature.

If the value of n is taken to be 1.277 this formula becomes:

$$Hp/Q_s = 205.77\ (R^{0.217} - 1) \quad (3)$$

The empirical formula used in this presentation is:

$$Hp/Q_s = 215\ (R^{0.217} - 1) + 4R^{0.8} - R^{1.25} \quad (4)$$

Any such formula or any set of data giving horsepower per million cubic feet at given compression ratios may be used. The answers obtained are, of course, consistent with whatever data are put into the calculator.

Similarly, values for the capacity of a gas-compressor cylinder may be calculated.

The theoretical capacity of a compressor cylinder is:

$$Q_c = \frac{E_v\ PD\ P_1\ 1{,}440}{14.73 \times 10^6} \quad (5)$$

Where:

- Q_c = M.M.c.f. per day
- E_v = volumetric efficiency
- PD = piston displacement in c.f.m.
- P_1 = suction pressure in psia. at compressor flange
- P_2 = discharge pressure in psia. at compressor flange
- 1,440 = minutes per day
- 14.73 = pressure base, psia.

The value for E_v may be obtained from a compressor indicator card or may be calculated.

The theoretical value for E_v under adiabatic conditions is given by:

$$E_v = 1 - C\ (R^{1/n} - 1) \quad (6)$$

where C is per cent clearance divided by 100.

The empirical formula used in this presentation is:

$$E_v = 0.98 - C\ (R^{0.783} - 1) \quad (7)$$

(Any formula giving E_v as a func-

tion of clearance and compression ratio may be used.)

Substituting Equation 7 in Equation 5 we have:

$$Q_s = \frac{[0.98 - C(R^{0.783} - 1)]\, PD\, P_1\, 1{,}440}{14.73 \times 10^6} \quad (8)$$

Multicylinder units . . . Calculations for compressor engines having multiple compressor cylinders may be made by calculating the values for each active end of each cylinder separately and adding the results to obtain values for the entire engine; or all cylinders may be taken as a unit, after first examining each active end of each cylinder to determine that the value of E_v for all values of clearance, which would apply, results in a positive value of E_v for all cylinders.

In the procedure presented here, the entire engine is treated as a single unit located in a compressor station. Values of P_{1g} (suction pressure) and P_{2g} (discharge pressure) refer to the gage pressures existing at the points where the station piping connects to the main pipeline. An arbitrary value of 5 psi. has been used on both suction and discharge pressures to allow for losses between the compressor cylinders and the pressure reference points. An arbitrary value of 15 psi. is used to convert gage pressure at the main pipeline to absolute pressures at that point, therefore $P_{1g} = P_1 - 10$ and $P_{2g} = P_2 - 20$.

Preparation of Curves

In presenting the performance data as curves, the style of curve shown in Fig. 1 has been selected. On these curves, suction and discharge pressures referred to gage pressure at the main pipeline are used as the coordinates and lines of constant horsepower and constant capacity are plotted for a given engine setting. The term "engine setting" refers to the number of cylinder ends made inactive and to the number of clearance unloaders open. This is shown on the curves by two numbers such as "0-5 setting" where the first number "0" refers to the number of ends made inactive and the second number "5" refers to the number of clearance unloaders open on the active ends.

This data also can be presented as a curve (shown in Fig. 2), using suction and discharge pressures as coordinates and plotting curves of constant engine setting for a given horsepower, usually rated horsepower or some per cent of rated horsepower at which the engine may be run.

This curve can be used by the operator to set his engine without referring to the performance curves. It is also used as an index to the performance curves. Another valuable use of this curve is to show a designer the limiting combinations of pressures for which the engine can be loaded at the selected horsepower and clearance.

In setting up the equations for the I.B.M. calculator, Equations 4 and 8 are multiplied together and solved for P_1 to give the following equations:

$$Hp/Q_s\,(Q_s) = Hp = [215\,(R^{0.217} - 1) + R^{0.8} - R^{1.25}]\,(0.00009776) \times [0.98 - C\,(R^{0.783} - 1)]\,PD\,P_1 \quad (9)$$

Solving for P_1:

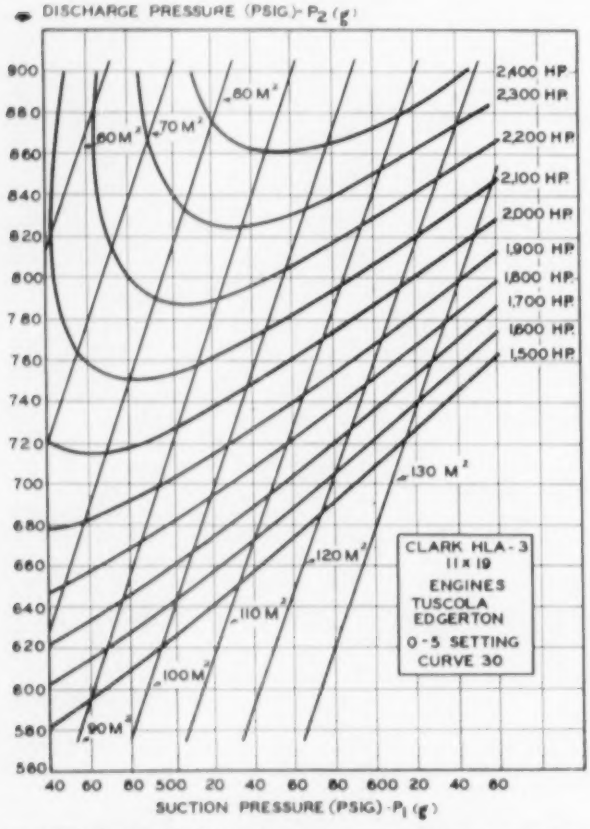
$$P_1 = \frac{Hp}{(0.00009776\ PD)\,[0.98 - C\,(R^{0.783} - 1)]\,(Hp/Q_s)} \quad (10)$$

Let this value of P_1 be called P_{1h} for reference purposes then:

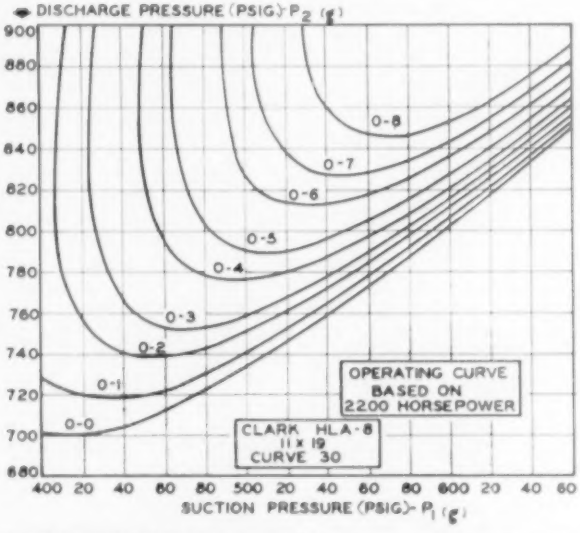
$$P_{1gh} = P_{1h} - 10 \quad (11)$$

From Equation 8:

$$P_1 = \frac{Q}{[0.98 - C\,(R^{0.784} - 1)]\,(0.00009776)\,PD} \quad (12)$$



ENGINE OPERATING CURVE with compressor having no valves lifted, five clearance pockets open. Fig. 1.



OPERATING CURVES with various clearance pockets opened and unit operating at 2,200 hp. Fig. 2.

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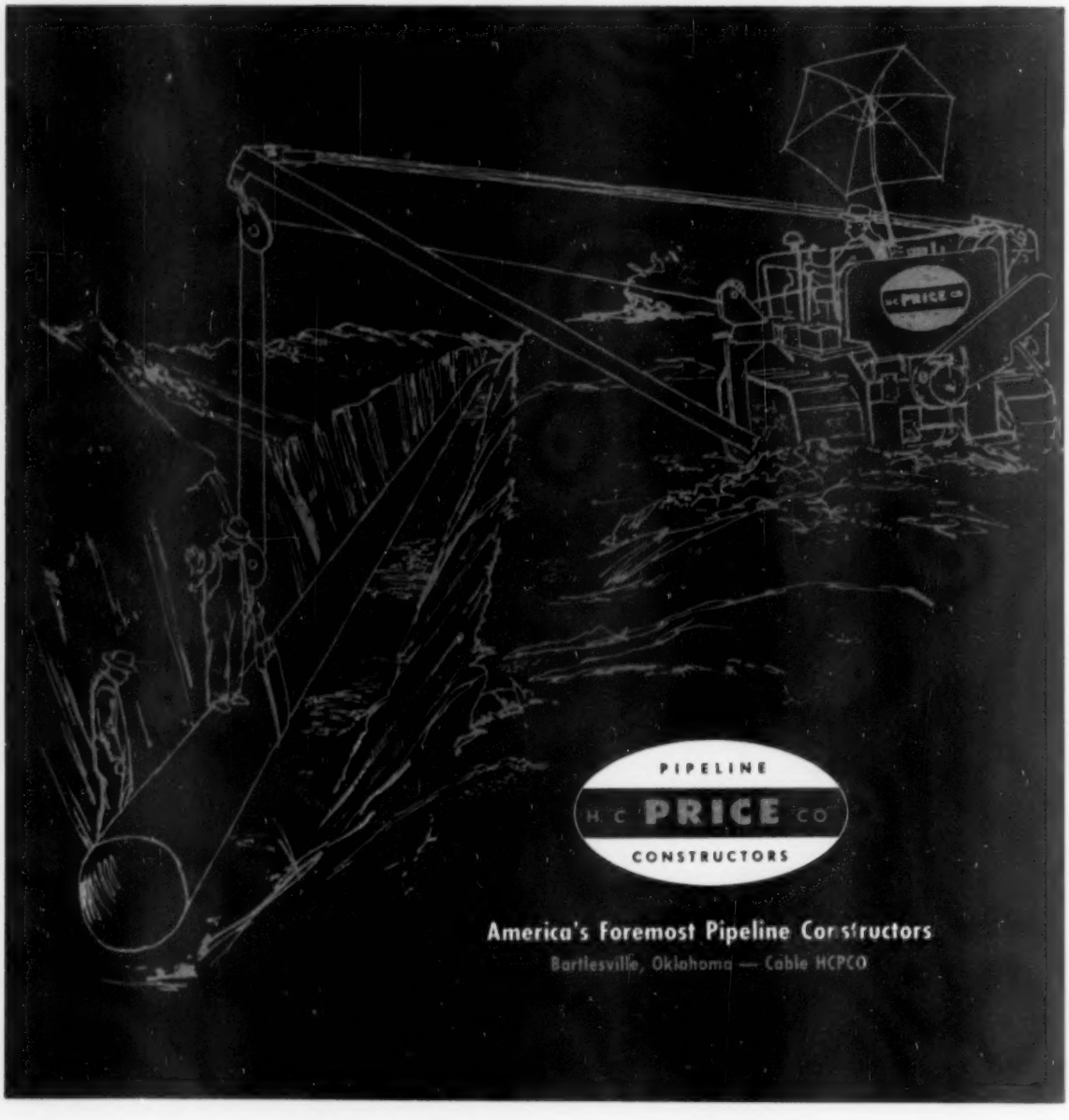


TABLE 1—I.B.M. CODE FOR CALCULATING HORSEPOWER AND CAPACITY CURVES

R	Hp/Q_s	$R^{0.783}-1$
1.2	12.050	0.1535
1.25	14.130	0.1909
1.3	16.140	0.2281
1.35	18.097	0.2649
1.4	19.999	0.3014
1.5	23.647	0.3737
1.6	27.112	0.4449
1.7	30.413	0.5151
1.8	33.565	0.5845
1.9	36.585	0.6530
2.0	39.483	0.7207
2.1	42.270	0.7877
2.2	44.956	0.8540
2.3	47.550	0.9197
2.4	50.050	0.9847
2.5	52.490	1.0492

Let this value of P_1 be called P_{1q} to distinguish it from the value obtained in Equation 10, then:

$$P_{1gq} = P_{1q} - 10 \qquad (13)$$

An examination of these equations shows two terms which are difficult to calculate on the 604 calculator. These are the Hp/Q_s function and $(R^{0.783}-1)$, both functions of R only. To simplify the calculations, these terms are evaluated for specific values of R, and the results, together with the constants 0.98 and 0.00009776, are transferred to a master deck of tabulating cards for permanent reference.

Equations 10 and 11 can now be solved for values of P_{1g6} at specific values of R by substituting appropriate values of Hp, PD, C, Hp/Q_s, and $R^{0.783}-1$.

Equations 12 and 13 can also be solved for values of P_{1gq} in a similar manner by substituting values of Q, C, $(R^{0.783}-1)$, and PD.

The step-by-step procedure for evaluating Equations 10, 11, 12, and 13 and plotting the results as performance curves follows:

1. Each term to be handled by the I.B.M. calculator is given a designation for reference purposes. The letters A through T have been used to designate the various terms.

2. These terms are then described and the decimals and significant figures to which they are to be worked is determined.

3. The term designations, term descriptions, and the significant figures which we have used in our work is given in Table 2.

Note that term N is the solution of Equation 10, O is the solution of Equation 11, P is the solution of Equation 12, and Q the solution to Equation 13.

The terms A through H plus R, S, and T are transcribed to a deck of tabulating cards.

The terms I through Q are calculated on the 604 calculator. The procedure for transcribing and calculating the data follows:

(a) A deck of tabulating cards is key punched for each engine type number T and displacement B together with each combination of setting designation S and clearance ratio C.

(b) A second deck of tabulating cards is key punched with combination values of horsepower G and capacity H.

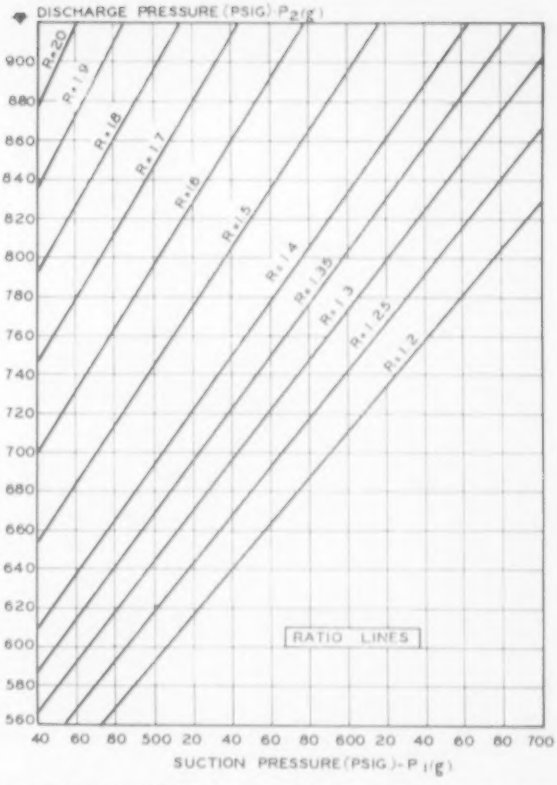
(c) The permanent master deck referred to above containing values of A, D, E, and F for all values of R is sorted for the values of R stated for the problem.

(d) All the data on the above cards are then reproduced for each ratio R involved, each combination of S and C involved and each combination of G and H involved. This is done in two steps. First, combine the data in (a) and (c) into a deck, and then combine this data with the data in (b) into a deck. This then becomes the final working deck for the problem involved.

(e) The working deck is then processed through the Type 604 calculator to develop values of O and Q. Fig. 4 shows part of calculator planning chart.

(f) The cards are then sorted on the following fields: (1) R, ratio, (2) G, horsepower, and (3) S, setting.

(g) The tabulated report as shown in Table 3 is then prepared on the printer.



RATIO LINES which are computed first and used as master chart. Fig. 3.

Example

A typical problem as it is usually presented to the tabulating section follows: (It is assumed that the master reference deck referred to above has been previously prepared.)

Given: T = 30.0; R all values from 1.2 to 2.4; B = 1,213; S, C, G, and H (see tabulation below):

S	C	G	H
000	0.5000	1,500	060
001	0.5284	1,600	070
002	0.5751	1,700	080
003	0.6035	1,800	090
004	0.6503	1,900	100
005	0.6787	2,000	110
006	0.7254	2,100	120
007	0.7538	2,200	130
008	0.8005	2,300	140
		2,400	150

For each combination of S and C any number of combinations of G and H may be used. The above values have been selected for this problem and G and H are arbitrarily paired as shown.

Find:

Values of P_{1g6} and P_{1gq} correlated to values of compression ratio, capacity, horsepower, and engine setting (see Table 3).

Having obtained the report shown in Table 3, the data can be plotted to yield curves as shown in Figs. 1 and 2.

To aid in plotting the data, a master chart, shown in Fig. 3, is first prepared by plotting lines of constant R vs. suction and discharge pressure. Note that P_{1g} and P_{2g} are gage pressures as defined above, and R is based on absolute pressures at the compressor.

The final charts are prepared by superimposing the graph paper on which the charts are to be plotted over the master chart and plotting the values of P_{1g6} and P_{1gq} for corresponding values of horsepower and capacity for the given ratio. This plotting is simplified by the fact that all plotted values fall on the lines of constant R of the master chart and all values of equal horsepower and equal capacity are grouped together on the printed report as described in (f) above.

The charts of Figs. 1 and 2 are plotted from the same data by changing the parameters. It will be noted,

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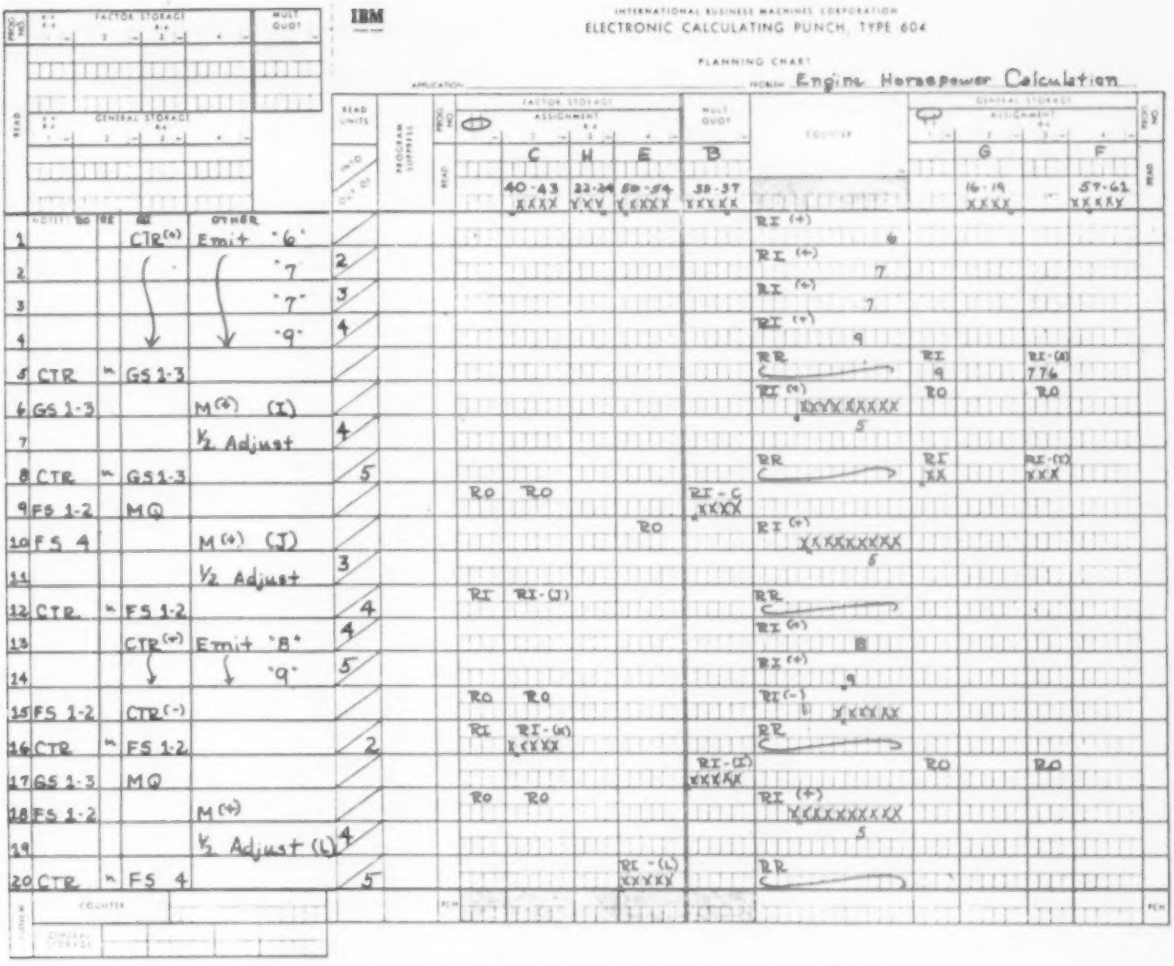

PORTION OF PLANNING SHEET used in making engine horsepower calculations. Fig. 4.

for example, that the 0-5 curve in Fig. 2 is the same as the 2,200-hp. curve in Fig. 1.

This method has saved our company many valuable engineering man-hours, provided data over a greater range than was feasible earlier, and increased the precision of the answers. The number of engineering man-hours now required for calculation is only 5 per cent of that required earlier.

Acknowledgment

The authors gratefully acknowledge the assistance of Kenneth A. Johnson, head of the tabulating section, in the preparation of this paper.

TABLE 2—DATA TRANSCRIBED ON THE TABULATING CARDS

Term designation	Definition	Decimals and significant figures
R	Compression ratio	X.XX
S	Engine setting designation	X.XX
T	Engine designation for reference	XX.X
A	Constant	0.00009776**
B	Piston displacement (PD)	XXXX.X
C	Clearance ratio (C)	XXXX
D	Constant	0.98**
E	$R^{0.783} - 1$	X.XXXX**
F	Hp/Q_s	XX.XX**
G	Hp	XXX0.
H	Capacity	XXX.
I	(A) (B)	XXXXX
J	(C) (E)	XXXXX
K	(D — J)	XXXX
L	(I) (K)	XXXXX
M	(F) (L)	X.XXXX
N	(G/M)	XXXX.
O	(N — 10) (P_{gs} Equation 11)	XXXX.
P	(H/L)	XXXX.
Q	(P — 10) (P_{gs} Equation 13)	XXXX.

TABLE 3—ENGINE OPERATING CURVE CALCULATION NO. 30

Pocket setting	Hp	Ratio ×100	P_{gs}	Capacity	P_{gs}
0-05	2,000	120	793	100	474
0-05	2,000	125	695	100	489
0-05	2,000	130	626	100	503
0-05	2,000	135	575	100	520
0-05	2,000	140	540	100	540
0-05	2,000	150	482	100	573
0-05	2,000	160	451	100	614
0-05	2,000	170	431	100	662
0-05	2,000	180	423	100	716
0-05	2,000	190	421	100	779
0-05	2,000	200	427	100	841
0-05	2,000	210	440	100	941
0-05	2,000	220	461	100	1,048
0-05	2,000	230	491	100	1,180
0-05	2,000	240	532	100	1,348
0-05	2,100	120	833	110	522
0-05	2,100	125	731	110	538
0-05	2,100	130	658	110	555
0-05	2,100	135	605	110	573
0-05	2,100	140	547	110	595
0-05	2,100	150	507	110	631
0-05	2,100	160	474	110	677
0-05	2,100	170	453	110	720

by W. L. Nelson
Technical Editor

COST-imating

17. Costs of Electrical Equipment

THE costs of pump and motor units were indicated in Cost-imating No. 16, (The Oil and Gas Journal, August 13, 156). In addition, the cost of motors is indicated in Table 1 herein. Explosionproof motors are slightly more expensive than splashproof motors and the higher-voltage motors and controls are more expensive. The costs of transformers, electrical lines, and miscellaneous equipment are indicated in Tables 2, 4, and 5 herein. The cost of refinery power plants (Table 3) varies widely. The main variable is size, as illustrated for small oil-field plants in Table 1. The small plants are mounted on skids whereas the larger ones are set on permanent foundations. All of the oil-field types are housed in steel mill-type buildings, or wood-frame corrugated-sheet steel. Small refinery power plants probably cost 10-15 per cent more than the oil-field types listed in Table 3.

TABLE 1

Approximate Cost of Motors, Including Line, Starter, and Safety Equipment,[1 2] Dollars (1946) per Horsepower

Splashproof and explosionproof, 220-440 volt*

Hp.	Equipment	Installation
1	100-150	200-230
5	35-50	60-80
10	21-31	35-50
30	10-19	20-30
60	8-16	17-25
100	7.5-15	16-24

Explosionproof, 440-4,400 volt*

100	20-27†
200	18-21†
400	15-18†

*Explosionproof and high-voltage motors are the most expensive. †More elaborate control equipment required. Add 20-30 per cent for transformers and a share of incoming service feeder.

TABLE 2

Approximate Transformer[4] Costs (Dollars Each, 1946) But NOT Including Any Auxiliary Equipment or Lines

Size, kva.	Voltages	M	L
500	13,800/2,300	$3,120	$600
100	2,300/440	865	150
75	2,300/220	725	150
50	2,300/440/220	550	120
40	2,300/220	535	105
30	2,300/220	460	105
25	2,300/220	375	105
25	2,300/220/115	375	105
15	2,300/440/220	250	60
15	2,300/220/115	250	60
10	2,300/220/115	210	60
5	2,300/220/115	160	58
3	2,300/220/115	110	58

COST INDEXES OF ELECTRICAL EQUIPMENT (1946 = 100)[1]

	Motors and generators	Switchgear	Transformers	Wages, electricians	Nelson construction[2]
1946	100	100	100	100	100.0
1947	110	120	116		117.0
1948	129	127	127	124	132.5
1949	129	132	130	135	139.7
1950	135	142	137	138	146.2
1951	156	166	148	149	157.2
1952	155	161	148	157	163.6
1953	157	165	157	164	173.5
1954	158	171	162	168	179.8
1955	157	176	162	173	184.2

TABLE 3

Approximate Cost of Electrical Power Generating Plants (1946)[1 4 5]

Type of plant—	Material and labor ($ per kw.)
Petroleum refineries (85 plants)	125-157
Petroleum refineries at process steam pressures	157
Petroleum refineries, high-pressure	125
Electrical complete but no steam plant	105-115
By capacity:	
1,000 kw.	*166-214
3,000 kw.	*110-150
5,000 kw.	*100-140
20,000 kw.	*85-115
500,000 kw.	*80-106
Public utilities serving refineries	175 up
Oil-field service, complete, engine driven:†	
20 kw., small	235
60 kw., small	135
100 kw., small	118
140 kw., small	107
400-2,600 kw., large	125

*Main range of price. Outdoor type of construction is $5-$20 less than indoor type. †Probably 15-25 per cent cheaper than more permanent refinery installations.

TABLE 4

Approximate Cost[3] of Electrical Lines ($/Mile) Complete With Poles, Etc. (1946)*

Type of line—	Wire	Material*
13,200-v., 3-ph.	No. 2/0 copper	$2,250
2,300-v., 3-ph.	No. 1/0 copper	$1,750
2,300-v., 3-ph.	No. 2 copper	$1,250
2,300-v., 3-ph.	No. 4 copper	$1,050
2,300-v., 3-ph.	No. 6 copper	$ 925
2,300-v., single	No. 6 copper	$ 800
2,300-v., 3-ph.	No. 1/0 alum.	$1,250
440, 220, or 115 single or double		$1,250

*The labor cost is equal to the material cost.

TABLE 5

Miscellaneous Electrical Equipment—1946 Costs[1 4]

Equipment—	Unit	Material
Switches or receptacles	$ each	19
Conduit, rigid, galv. 1 in.	ct./ft.	16
Conduit, rigid, galv. ½ in.	ct./ft.	7.6
Cable, 600-volt, lead covered, No. 9, 3/c	$/M. ft.	280
Cable, 600-volt, lead covered, No. 4	$/M. ft.	600
Wire, black stranded, No. 8 RH, 600-volt	$/M. ft.	45
Wire, black twin flat, No. 16, 3/c	$/M. ft.	40
Lights, inside, std. industrial incl. fixtures, switch and line	$ each	*30-40
Lights, explosionproof	$ each	*83-100
Lights, outside, std. industrial flood	$ each	*300-500
Motor control box for oil-field service†	$ each	80
Telephone, installed	$ each	‡26
Telephone switchboard, 100-ft. line, automatic	$ each	‡10,000
Telephone system for pipelines	$/mile	$650
Telephone system, small plant	$ each	‡1,500-2,000

*Labor costs are 150-200 per cent of the material cost.[1] †7½ hp. and smaller, fused disconnecting switch, magnetic starter with overload trips, time-clock control, lightning arrester—all in box. ‡Material and labor.

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3. Wilson, W. B., Chem. Engineering, April 1953, p. 199.
4. Author's files.
5. FPC Report S-68 (1946); also see, Henry de Soto, Power Engineering, April 1953, p. 83.

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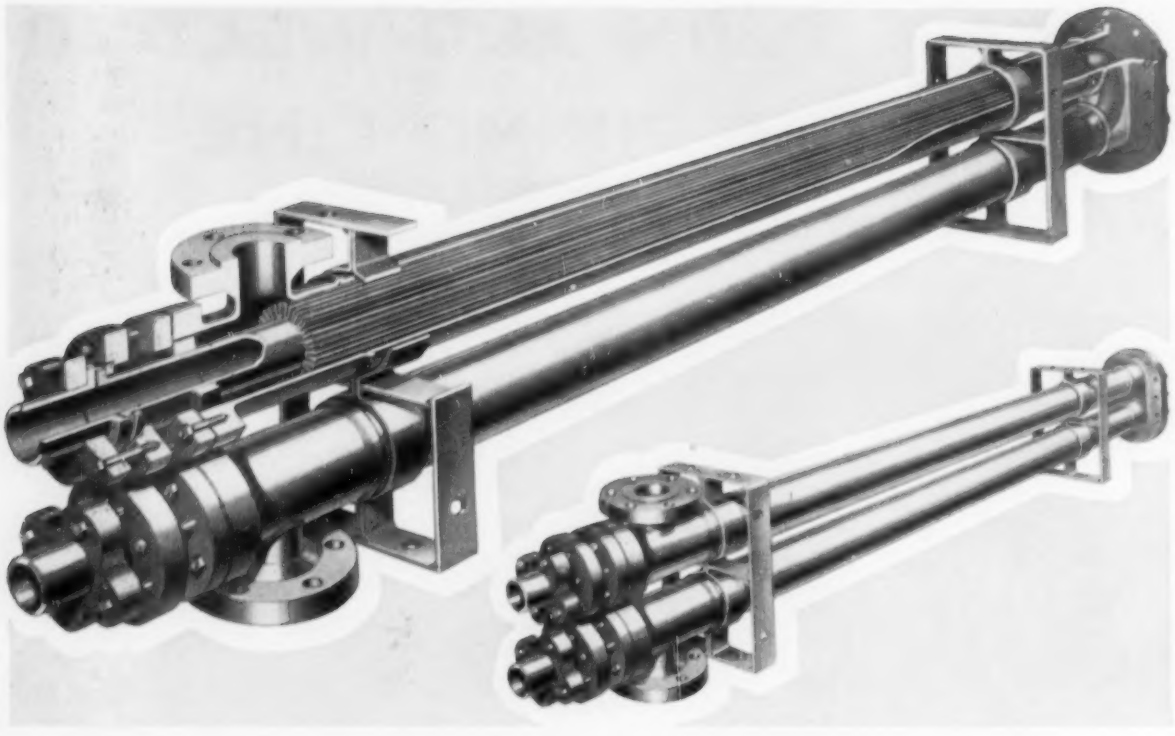

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Basic Design Factors for Rock Bits

by H. G. Bentson

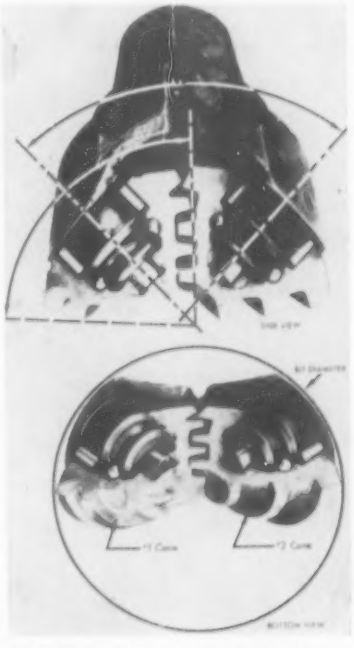
Design of rock bits requires the maximum use of the space within a circle representing the hole. Changes in any one design factor will also change other factors and influence bit performance.

THE first consideration in the physical design of any rock bit is one of space or room. Every element of a rock bit must be confined within a circle representative of the hole to be drilled. Fig. 4 illustrates this confinement. Shown are two legs of a three-cone bit on which sectioned No. 1 and No. 2 grooved cones have been assembled. The circle around the bottom view is representative of the bit diameter. As evidenced by the cone size and clearances, the maximum usable space has been utilized. An increase in the physical size of any one element must of necessity result in the decrease of one or more of the others.

. . . A prerequisite for the design of any two or three-cone bit is the determination of journal angle and offset. Normally, these values are based upon the manufacturer's previous experience and the characteristics of the formations which the bit is designed to drill. The effect of variations in these values will be explored later. However, a definition of the terms is required at this point. The term journal angle as illustrated by Fig. 5 may be described as the angle formed by a line perpendicular to the axis of the journal and the axis of the bit. Offset as illustrated by Fig. 6 may be defined as the horizontal distance between the axis of the bit and a vertical plane through the axis of the journal.

. . . Basic cone geometry is directly affected by an increase or decrease in the journal angle and offset values. The included angle A on Fig. 4 formed by the journal center lines is a function of the true journal angle. An increase in the journal angle will result in a decrease in angle A. If the clearances between the cones are maintained, then the included angle B of the cones must also decrease. An increase in journal angle will result in a decrease in the basic included angle of the cone.

Fig. 7 represents a three-cone design layout in the first stage of completion. Note that the inner portion of the No. 1 and No. 2 cone sections represents the same section shown in Fig. 4. Angles A and B also represent corresponding angles. Center lines C and the inner portion of the No. 3 cone have been added to complete the cluster design. The circle, around which the cone center lines are tangent, is a function of the predetermined offset. Since the journal angle determines the angle between cone center lines, the journal angle controls the geometry of the inner end of the cone.

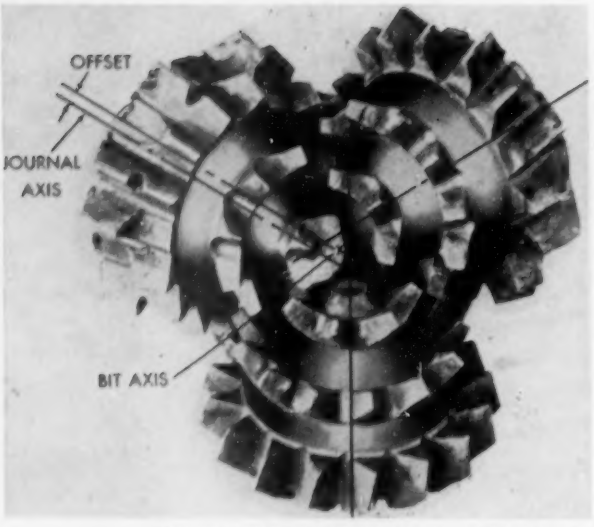


CONFINEMENT of three-cone-bit elements within bit diameter. Fig. 4.

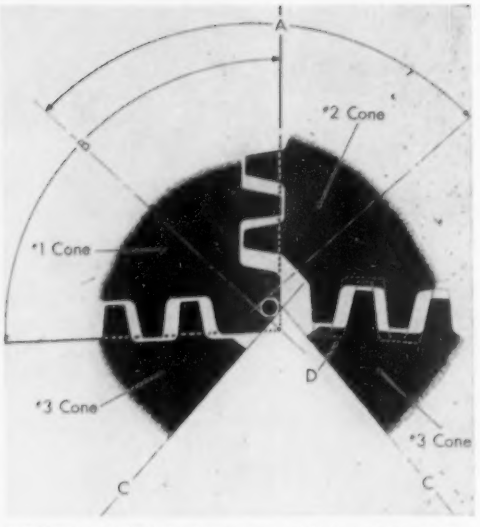
THREE-CONE BIT-LEG journal angle. Fig. 5.

Limited variation in tooth and groove depth is possible depending upon bearing requirements. The exaggerated variation at D shows the modification in cone geometry resulting from an increase in tooth depth. Although the size of the cone has been increased, it is evident that the modification would be made at the expense of a reduction in bearing size.

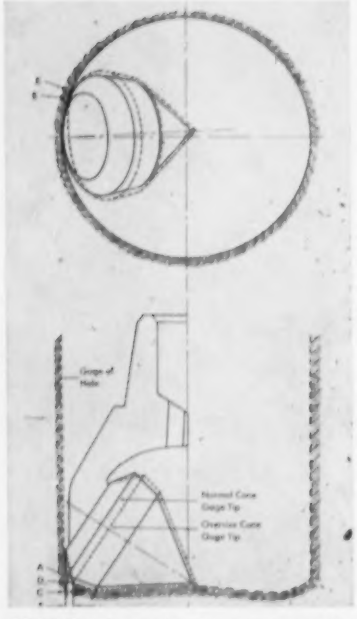
Author is chief sales engineer, H. C. Smith Tool Co., Compton, Calif.



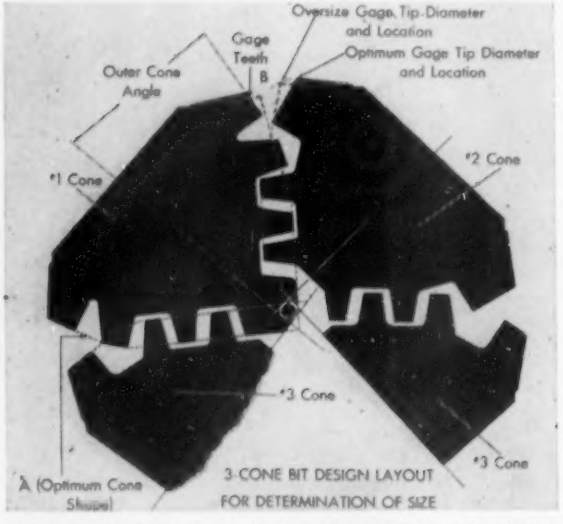
THREE-CONE bit offset. Fig. 6.



DESIGN LAYOUT of three-cone bit for determination of size and shape of inner end of cones. Fig. 7.



EFFECT of oversize three-cone gage-tip diameter on amount of reaming required by gage surface. Fig. 8.



LINES between Nos. 1 and 3 at A represent what might be the optimum cone shape for a given bit. This configuration, limited in diameter by the clearance between gage teeth of Nos. 1 and 2, has the most desirable characteristics of gage-tip location, outer cone angle, and tooth depth. Fig. 9.

Final geometry . . . The physical size and shape of the outer end of the cones is governed to a degree by the journal angle and offset. Final geometry, however, is determined on the basis of other considerations:

1. Amount gage tip must be moved toward the center of the bit to eliminate overgage conditions.
2. Clearance between the gage teeth of mating cones.
3. Wearing and cutting characteristics of the teeth.

The effect on the location of the gage tip by differences in gage-tip diameter is illustrated by Fig. 8. Optimum cone size is represented by solid lines and an oversize cone by dash lines. The use of an optimum gage-tip diameter in relation to the values of any given hole diameter, journal angle, and offset, positions the locations of the gage tip at A. Due primarily to the offset, but partially to a slightly large gage-tip diameter, full-gage contact by the gage tip occurs at B. The distance C, therefore, indicates a reasonable portion of the hole which must be reamed by the gage surface.

If the gage-tip diameter of the cone is increased to that indicated by the dash lines, the gage tip must be located at D to compensate for an overgage condition. Full-gage contact is maintained at E. However, an excessive amount of the formation must be removed by the reaming action of the gage surface, as shown by Dimension F. Under these conditions, it is evident that this would result in a rapid breakdown of the gage tip.

Fig. 9 further illustrates the limitations on the size and shape of the large end of the cone.

INSIDE FACTS

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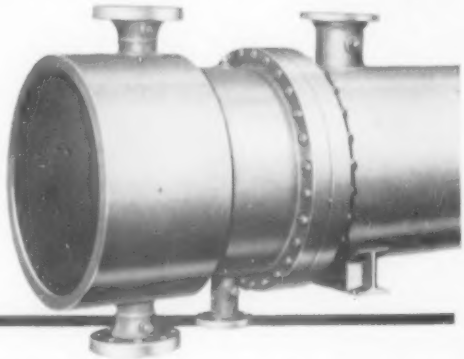

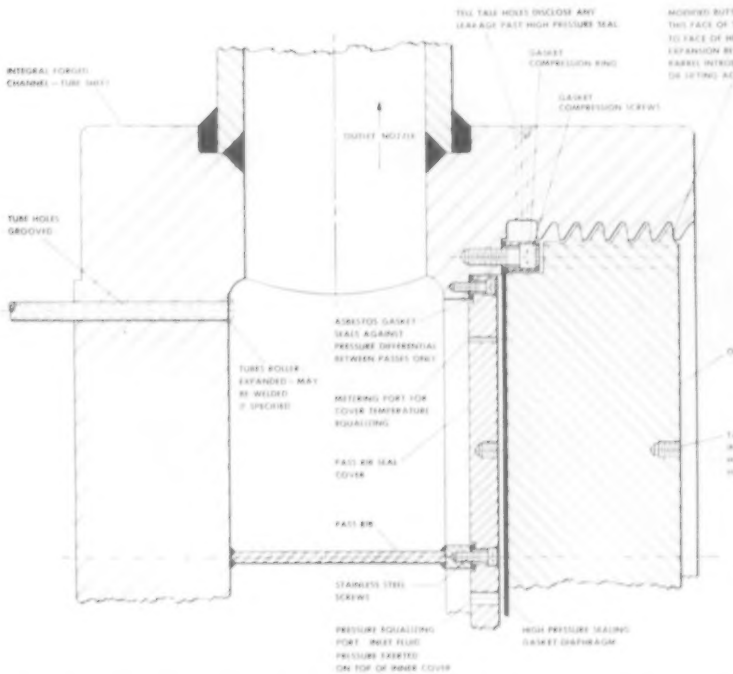
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MODIFIED BUTTRESS THREAD. THIS FACE OF THREAD PARALLEL TO FACE OF HEAD. DIFFERENTIAL EXPANSION BETWEEN HEAD AND BARREL INTRODUCES NO WEDGING OR SETTING ACTION IN HEAD
GASKET COMPRESSION SCREWS
OUTER NOZZLE
TUBE HOLES GROOVED
ASBESTOS GASKET SEALS AGAINST PRESSURE DIFFERENTIAL BETWEEN PASSES ONLY
TUBES ROLLER EXPANDED — MAY BE WELDED & SPECIFIED
METERING PORT FOR COVER TEMPERATURE EQUALIZING
PASS RIB SEAL COVER
PASS RIB
OUTER COVER
TAPPED HOLES IN INNER AND OUTER HEADS FOR ATTACHING HANDLING BRACKET
STAINLESS STEEL SCREWS
PRESSURE EQUALIZING PORT. INLET FLUID PRESSURE EXERTED ON TOP OF INNER COVER
HIGH PRESSURE SEALING GASKET-DIAPHRAGM

TYPICAL COVER HANDLING BRACKET FOR HORIZONTAL UNIT

GASKET COMPRESSION SCREWS SERVE ONLY TO COMPRESS DIAPHRAGM GASKET — DO NOT HAVE TO HOLD AGAINST HIGH PRESSURE. PRESSURE LOAD ALL TAKEN BY OUTER HEAD
DIAPHRAGM GASKET
GASKET COMPRESSION RING
OUTER HEAD
OUTER HEAD FURTHER SEALS DIAPHRAGM GASKET AGAINST SHOULDER OF CHANNEL BARREL

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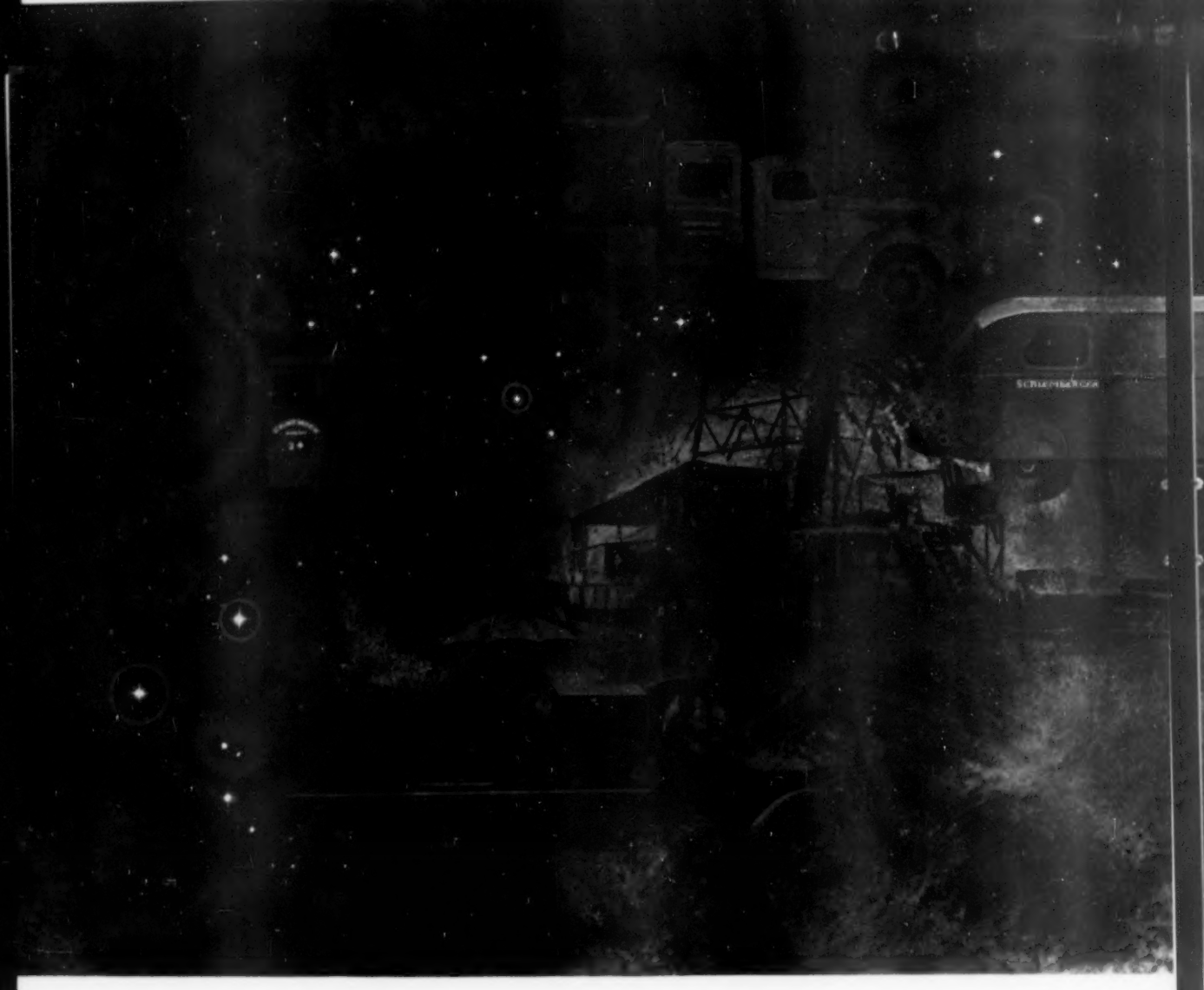

On July 10, 1956 . . . The one millionth operation by Schlumberger was run on the Humble Oil and Refining Company's Danbury Gas Unit No. 6, Well No. 1 in the Danbury Field.

When Schlumberger introduced electrical well logging to oil operators in the United States in 1929, it was a radically new approach to oil exploration. It was almost unbelieveable that accurate information could be obtained in such a manner; but it could — and was — time after time.

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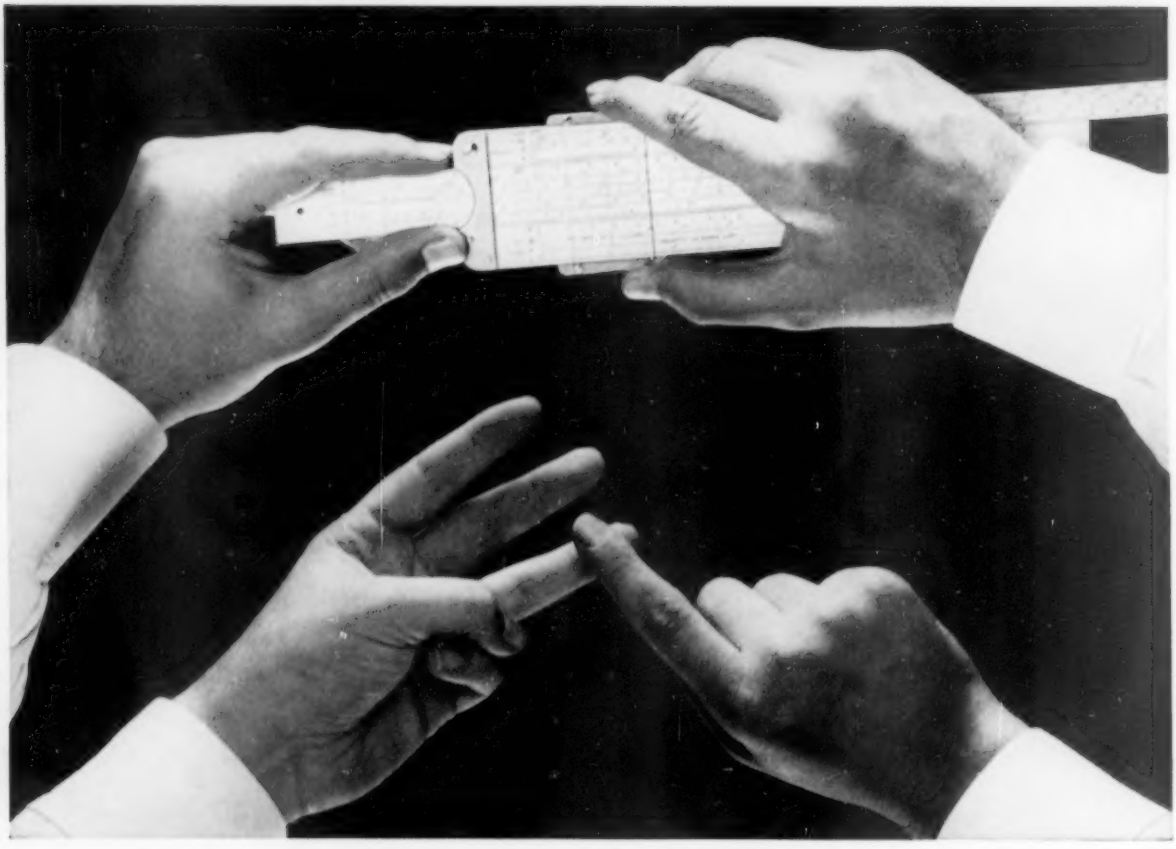

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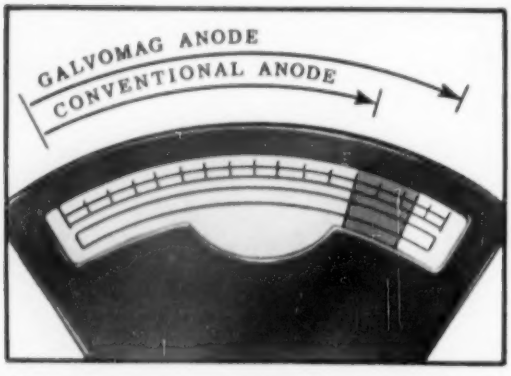

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SKY-HOOK CLAMP is shown opened before placement over the tank lip. Fig. 1.

COMPLETE sky hook in the closed position.

Sky hook protects tank painters

FREE MOVEMENT is allowed the painter when the sky hook is attached to the tank rim. Fig. 2.

ONE slip is just one too many for a man working 50 or more feet above ground painting wind girders or top courses on floating-roof tanks. Usually painters protect themselves by using a conventional C-clamp hooked over the lip of the tank with a safety belt attached to the clamp.

But this can be dangerous since the clamp has to be loosened when the painter changes position. While the clamp is loose a sudden gust of wind, a spell of dizziness, or a misstep might send a man crashing to the ground below.

To get around this danger the C-clamp has now been replaced with a new device—an ingenious "sky hook" which moves freely though attached to the tank at all times. Its efficient design has proved it an invention needing no refinement during the year's time it has been under test and constant use.

Its inventor is Jack Neil, safety engineer of the El Segundo refinery of Standard Oil Co. of California.

Here's how it works: Fig. 1 shows the clamp opened before placement over the tank lip. Bosses in the side view are where holes are bored for passage of the locking pin. Once the clamp is closed over the angle lip of the tank rim and the safety-belt pin is in place, nothing can cause the clamp to open or flip off the tank lip. Fig. 2 shows the hook ready for use. It can easily be moved around the tank as the painter works. Its fit is loose enough so that a straight pull will cause it to slide around the rim.

California Research Corp. filed an application for a patent on this device but have no intent of keeping it for themselves. Complete construction details will be sent to anyone, anywhere. A letter to Cal Research in San Francisco will get you the data.

Here's more about O-rings

. . . additional data for gland-leakage problems

IN the July 30 issue of The Oil and Gas Journal, page 263, an article appeared discussing use of O-rings for installation in place of packing to stop gland leakage in gate valves. The same article mentioned possible uses of the rings in glands of reciprocating pumps. Following are additional data on the subject from a manufacturer of O-ring products, Parco Rubber Products Co. of Houston.

"The installation discussed involves use of one of our buna-N compounds. This has given excellent service in crude oil except in a few spots where sulfur dioxide content or aromatics might call for a very specialized compound. Aside from the problem of volume swell from commodity attack on valve-stem packing, we see no reason why the O-rings could not be recommended for this service.

"We would recommend caution in using O-rings for pump-rod glands. The feet per minute travel would be a critical factor in such an application. Aside from volume swell, due to commodity reaction, we would find that if the feet per minute travel were substantial, the heat generated might cause premature failure, due to one or both of the following factors: (1) the Joule effect in rubber would cause a shrinkage or seizing of the shaft when the temperature rises, (2) the same temperature rise would also cause a slight volume increase in the compound, possibly causing even further friction, more heat generated, and the premature failure of the O-ring.

"These troubles can be minimized. Many designs can be successfully operated with proper attention to compounding and dimensioning the installation to compensate for the two factors mentioned. Still, dynamic application of O-ring seals should be considered individually, taking into account the above factors and such others as chamfering of the rods and edges of grooves to prevent damage during installation."

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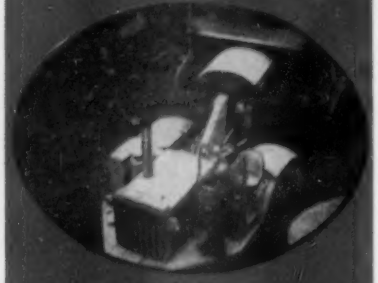

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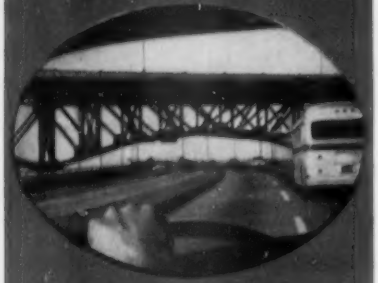

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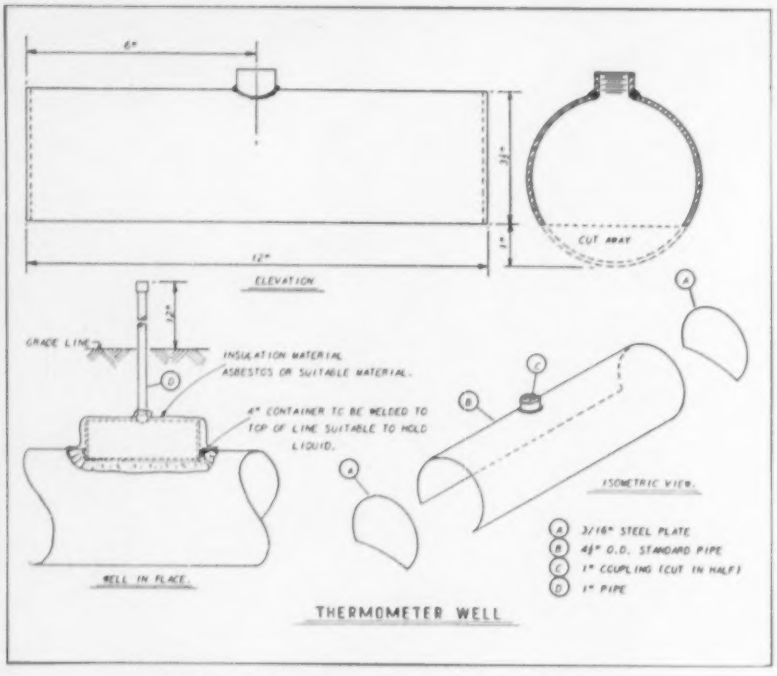
PIPELINE PATROL



WELDED-ON thermometer well is shown here with dimensions.

How thermometer well works

A NEW-TYPE welded-on thermometer well is being used by Panhandle Eastern Pipe Line Co. for accurate temperature measurements during line-flow tests. The thermometer well requires no line tap and poses no obstacle to scrapers.

It consists of a short length of 4-in. pipe with a strip cut out (see drawing) and with end plates welded on. A riser to hold the thermometer is welded into the top of the 4-in. pipe. The assembly is welded onto the top of the main line and filled with glycol so that heat will be conducted from the main pipe to the thermometer. Asbestos insulation around the riser keeps heat loss low.

The well was devised by A. B. Bartoszek of Panhandle Eastern. (Reprinted from Panhandle Lines.)

A.S.C.E. adds new pipeline division

THE American Society of Civil Engineers has authorized establishment of a pipeline division. Organization of the new unit is in process. Heretofore its interest and activities have been conducted by the Committee on Pipelines of the Construction Division.

Creation of the pipeline division reflects the relationship of civil engineers with the pipeline industry. It has been authorized to satisfy an increasing need for specialized technical and professional study, development and practice.

The purpose of the new division, is "to advance and correlate scientific knowledge and promote and coordinate economic development and construction of engineering projects in connection with the transmission of fluids by means of pipelines, and as it pertains, in particular, to the science of civil engineering in the fields of surveying and line location, design, construction, and operation. And to develop, promote, and further the mutual use of the codes for pressure piping as between pipeline, highway and railroad groups, and public authorities."

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Furnished with full beam counterweighting. Beam weights can be installed any place along beam without moving other weights. Safety rails provided. 15% crank counterweighting optional. Easily installed with two bolts.

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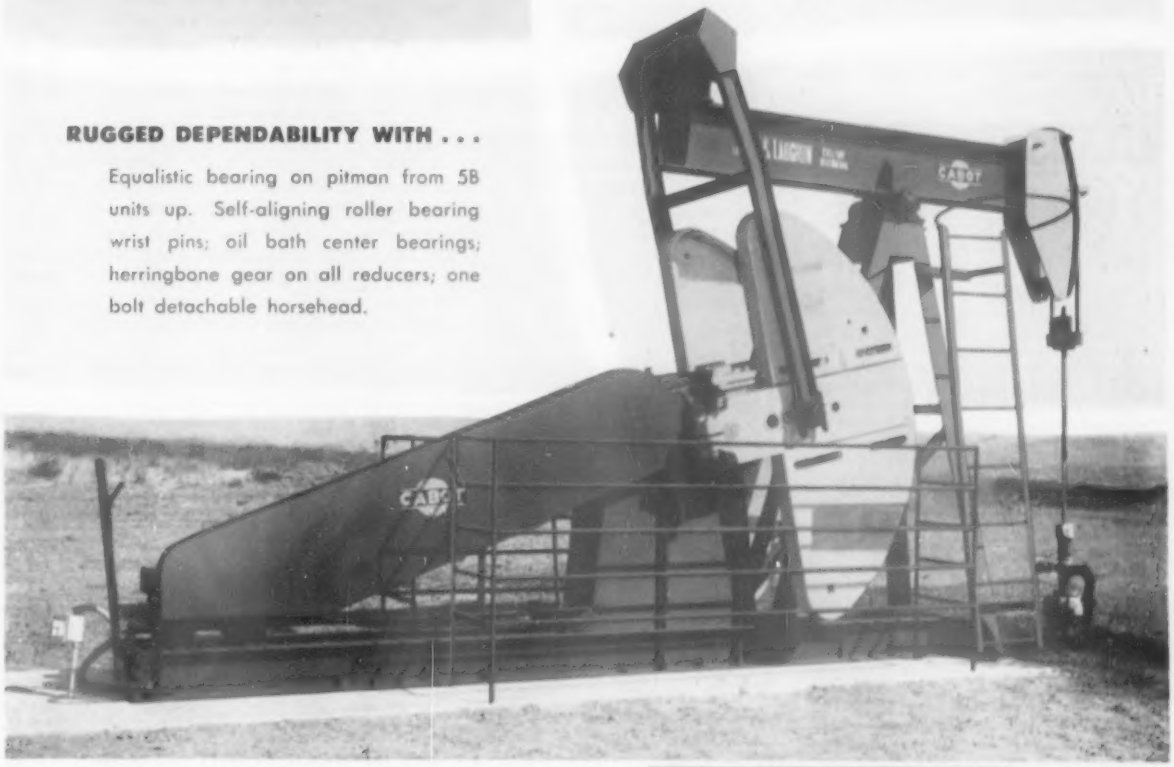
Equalistic bearing on pitman from 5B units up. Self-aligning roller bearing wrist pins; oil bath center bearings; herringbone gear on all reducers; one bolt detachable horsehead.



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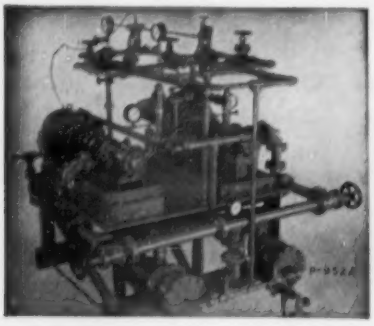

P-952-A—Steam Turbine and Electric Motor drive gives flexibility in this compact Model P-ES2H size No. 25 unit.

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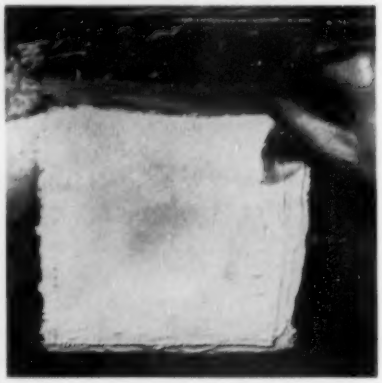


EPOXY resin material and glass cloth are used for tank repair.

Resin repairs hold

A NEW method for making repairs on storage tanks without welding has now been perfected. The method uses an epoxy resin material and glass cloth.

Patches made by this method have been tested to over 1,000 psi. for extended periods without failure. Corroded or broken-out areas, split seams, leaking rivets, etc., can be repaired in tanks or pipes handling products, crude oils, acids, or alkalis.

A typical tank repair is shown in Fig. 1. First the area surrounding the break or hole is cleaned down to bare metal and washed to remove all oil and grease. When the metal is dry a primer is mixed and painted onto the patching area and allowed to get tacky-hard. This takes about a half hour at 70° F. Then a glass cloth patch of the proper size is placed into position and pressed into the prime coat.

The epoxy compound is then painted over the glass cloth. A second patch is placed over the first and the painting operation repeated.

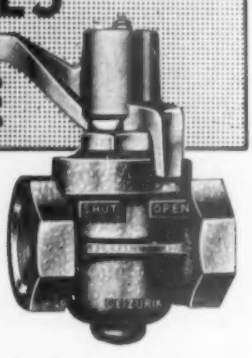
Two glass-cloth layers will usually suffice for a small tank with low head; three or four are needed for large tanks or for use with acids or alkalis.

For a neater job successive patches are cut slightly larger, thus feathering the edges as the patching progresses. The completed patch can be filed or sanded smooth.

The patch will harden and the tank can be used in 18 hours at room temperature. External heat from any source must be applied if the hardening is to take place properly in cold weather or if the situation requires a faster cure.

Repair kits with necessary material for this operation are made by Smooth-On Manufacturing Co., Jersey City.

DeZURIK VALVES STOP LEAKAGE



IN SO MANY PETROLEUM INSTALLATIONS

On bleeder lines from pumping wells, on water treater tanks, on rotary drilling mud, on crude oil tank battery lines, on suction to high pressure oil well cementing pump trucks, on vacuum tanks . . . on these and many other petroleum applications, DeZurik Valves are demonstrating a remarkable ability to stop leakage without constant maintenance. On liquid flow or vacuum . . . you'll find DeZurik Easy-Operating Plug Valves will do a superior job!

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Among the

Drilling Contractors

Jett Drilling Co., Inc., Shreveport, has a new deep-drilling operation 7 miles southeast of Farmersville, in southern Union Parish, North Louisiana. It is a Smackover test with objective about 11,000 ft. Location is for 1 Baughman Unit, in 8-20n-2e, a wildcat.

Maxwell Herring Drilling Corp., Kilgore, Tex., has a rig under contract to Gulf Refining Co. for a wildcat test 1½ miles south of Williams, in Red River Parish, North Louisiana. Drilling will be carried to the Hosston formation, or 6,500 ft. Location is on Gulf's J. T. Bundrick lease in 27-14n-11w.

Pioneer Drilling Co., Casper, is keeping a rig working for Carter Oil Co. in the new Wolf Springs field, about 50 miles northeast of Billings, in Yellowstone County, Montana. It now is going to Carter's eighth well to be drilled since January. It is 1 Horton, in 20-7n-32e. The field, discovered later in 1955, is oil-productive from the Amsden dolomite formations about 6,200 ft.

Sunnyland Contracting Co., Rayne, La., is under way on the first of two Glen Rose exploratory tests it has contracted to drill for Vaughey & Vaughey on their 17,000-acre block southwest of Fitler, in Issaquenna County, in far-western Mississippi. It is at 1-A Slick-Moorman, in 31-10n-8w. Location of the second test is 3 miles southwest at 1 Anderson-Tully, in 14-9n-9w. The operators plan to drill at least two additional tests. The block is in rank wildcat territory. Nearest production is 15 miles west in Louisiana's East Carroll Parish. Nearest Mississippi field is Tinsley, 35 miles east.

J. B. Drilling Co. is contractor on a 6,950-ft. Vicksburg test F. G. Weimer and J. R. Fitzhugh, of Tulsa, will drill at a wildcat location 3 miles east of North Starks field, in Beauregard Parish, southwestern Louisiana. Location is on Lutcher-Moore land in 3-7s-12w.

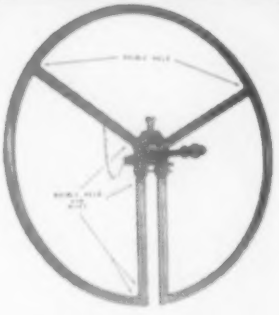
Jett Drilling Co., Shreveport, has a rig working on a wildcat location a mile west of production in the Lobdell area, West Baton Rouge Parish, South Louisiana. It is a 9,500-ft. test for G. H. Jett, of the contracting firm. Permit is for 1 Morley Cypress, in 3-7s-11e.

C. G. Glasscock Drilling Co., Corpus Christi, Tex., is under contract for an 11,000-ft. test to be drilled for Shell Oil Co. at a wildcat location in Block 164, Vermilion area, Gulf of Mexico. Location is 50 miles offshore from Vermilion Parish, Louisiana.

Falcon Seaboard Drilling Co., Tulsa and Houston, is drilling for Humble Oil & Refining Co. at a wildcat location 3½ miles west of McKinney, in

Wildcatting in the wide-open spaces of Oklahoma's Panhandle. Shown is Garvey Drilling Co. (Wichita) rig operating for Panhandle Eastern Pipe Line Co. in active Texas County. It is engaged in exploration of potentially productive horizons below the Permian gas zones on the east side of the Hugoton field.

SAFETY WHEEL WRENCH



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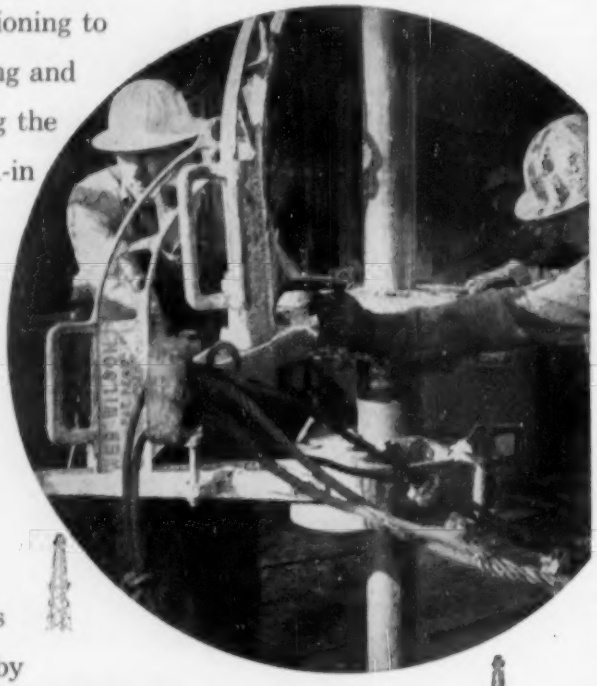
protect NEW joints

Trying to break out galled and seized new tool joints often results in bent drill pipe. You can prevent this by making up new joints with 'Bestolife Lead Seal.

'Bestolife provides the necessary film strength and metal cushioning to prevent galling and seizing during the critical break-in period – and permits easy break out. This means long, economical life for your tool joints.



'Bestolife is stocked by leading supply houses the world over.

In 1¼, 5, 20 and 50 lb. cans.

Unconditionally guaranteed.

I. H. GRANCELL

1601 E. NADEAU ST., LOS ANGELES 1, CALIFORNIA

Collin County, North Texas. It is a 12,000-ft. test. It is listed as 1 Atkins with location in the John McGarrah Survey.

Green & Heiser Drilling Co., Bakersfield, Calif., has a new wildcat operation in the Riverdale area of Kings County, Central California. It is a contract job for Malco Asphalt & Refining Co. at 1 Cobb, in 1-18-19. Location is 5 miles south of Riverdale. Projected depth is 8,000 ft.

Goldrus Drilling Co., Houston, has a new deep wildcat job under contract. It is 9,000-ft. test 6 miles northwest of Mission, in southern Hidalgo County, in Texas' Rio Grande Valley. Goldston Oil Corp., an associated company, also of Houston. Location is for 1 E. A. Showers estate, in Porcion 79.

Larco Drilling Co., Jackson, Miss., has taken a well-deepening job in Forrest County, southern Mississippi. It is for Seaboard Oil Co. at 1 Chancellor, a wildcat, in 8-1n-12w, 1½ miles northwest of Brooklyn. Hole will be deepened from its old total depth of 10,021 ft. to about 12,000 ft. Location is about 5 miles northeast of the Maxie area, in the southern part of the county.

Loffland Brothers Co., Tulsa, has the contract for another deep wildcat test E. Cockrell, Jr., has projected for the Raceland area, in Lafourche Parish, Coastal Louisiana. Location at 2 Godchaux, in 30-15s-18e, is northwest of production. Plans call for drilling to 12,000 ft.

Nowery Drilling Co., Shreveport, La., has a new wildcat operation in Shelby County, eastern Texas. It is a contract job for Gulf Oil Corp. and V. P. Grage. Location, at 1 Johnson, in the James Alford Survey, is about 4 miles northwest of Center. It is set up as a 7,300-ft. test.

Trant Drilling Co. is contractor on a new deep test Carter-Gragg Oil Co. is putting down in the Wright Mountain area, 6 miles southwest of Gladewater, in Smith County, East Texas. The test, 1 Stites Unit, in the Oscar Hawkins Survey, is scheduled to go to 8,500 ft.

Penrod Drilling Co., Shreveport, is set up for 14,500-ft. drilling on a wildcat test it is starting 2 miles southwest of South Louisiana's Paradis field, 30 miles southwest of New Orleans. Location is in Lafourche Parish. It is being drilled for the account of W. H. Hunt, of Dallas, on a Louisiana Land & Exploration Co. lease.

NO WONDER IT'S THE WORLD'S LARGEST SELLER

more than

10,000

O·C·T type "JE"

FLOW CONTROLS have been installed

It is easy to see why the O-C-T type "JE" is the world's largest seller when you remember it is the **only** flow control that offers **all** these savings.

Low first cost. You can save as much as $300 on every tree when you use the O-C-T "JE".

Long life. The "JE" uses a heavy duty, hard-faced valve-type gate and seat assembly for long, trouble-free service.

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Get the full story from your O-C-T representative. The O-C-T type "JE" flow control is available through all Christmas tree manufacturers and more than 700 supply store locations.

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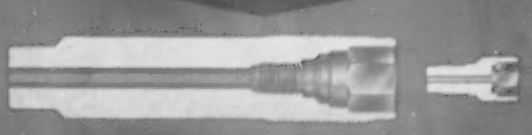
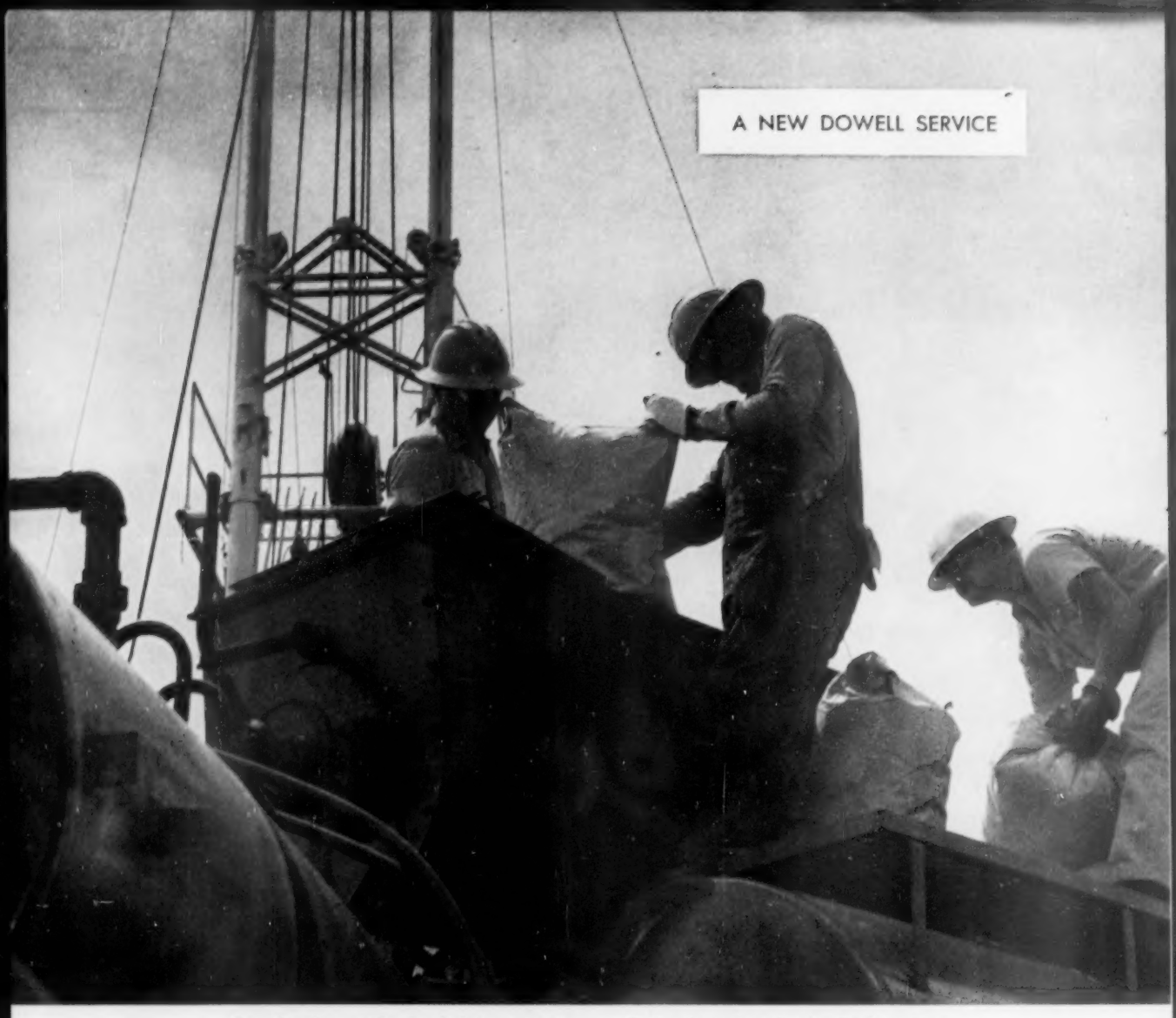
Export Representatives: Sterling Areas — Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

O-C-T CHOKES FOR EVERY WELL



O-C-T makes a complete line of positive and adjustable chokes of all sizes and pressure ratings. There is an O-C-T choke for every production situation.



Dowell engineers tailor Sandlock treatment to your well after thorough study of well information.

SANDLOCK

shuts out sand with plastic-coated walnut shells

SANDLOCK*, an exclusive new Dowell service, creates a permeable network of crushed walnut shells coated with plastic to control unconsolidated sand.

In a Sandlock treatment, crushed, graded walnut shells are coated with unset plastic. The coated shells are mixed into oil and displaced into the formation. The plastic hardens, forming a strongly consolidated, highly permeable network that needs no retaining screens or liners. Working time can be varied from 1 to 15 hours. Shut-in time is normally less than 24 hours.

In tests, Sandlock networks have shown tensile and compressive strengths comparable to sandstone and virtually complete resistance to sand erosion. Tests also indicated that a Sandlock network will prevent the production of all sand that is retained on a 140 mesh standard sieve.

If incompetent sand is hindering production from your well, talk it over with a Dowell engineer. For Sandlock service, or for more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department H-11.

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services for the oil industry

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The OIL AND GAS JOURNAL

Showcase

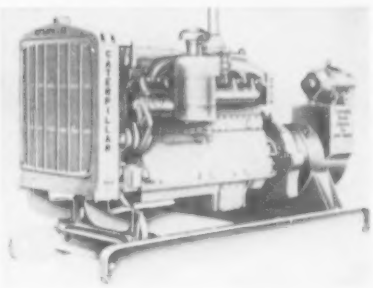
OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

Swivel Serves Rigs Drilling to Medium Depths

The new 75 WP swivel is especially designed for drilling medium-depth oil wells, for deep slim-hole drilling, and for the heavier work-over rigs. It is efficiently economical and features a high ratio of capacity to weight. It is of alloy steel throughout and is available with bail or elevator shank. It has angular-contact type ball bearings, mounted to assure ample radial stability. Automatic grease seals retain bearing lubricant. The stuffing box is

easily replaced and requires Chevron or V-type packing. The rugged field tests proved superior performance to 4,000 ft. with 4½-in. drill pipe and to 5,000 ft. with 3½-in. drill pipe. **For more information write or call: King Oil Tools, 7944 Dockal Road, Houston, Tex.**



Cat D342 Diesel-Electric Set Rated at 100 Kw.

This new 100-kw. self-regulated diesel-electric unit features close voltage regulation and in most cases is capable of filling the needs of applications now served by externally regulated units. Voltage droop and terminal voltage can be adjusted on the new generator to meet the needs of special installations. After adjustment, the controls are locked and no further adjustments are required.

No elaborate switchboard or external controls are required. It is easily paralleled with other generators. Sufficient electrical capacity has been built into the new generator to give it the ability to handle the surge of heavy loads without affecting existing loads. **For more information write or call: Caterpillar Tractor Co., Peoria, Ill.**

•

Air-Pressure Regulator Offers Pilot Control

Giving accurate pressure control with maximum air flow, this new Model 20AA-16 air-pressure regulator is a 2-in. pilot-controlled, high-capacity regulator for precision in air control over a wide operation range. This model reduces line pressures of up to 400 psi. to working pressures of from 2 to 125 psi. Its temperature range is from —40° F. to 200° F.

A pressurized chamber provides the

OIL AND GAS JOURNAL **Showcase Coupon**

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MANUFACTURER _____

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CITY _____ STATE _____

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Described in the Aug. 27, 1956, issue of The Oil and Gas Journal

NAME _____ TITLE _____

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DATE _____

A Rod pump with an AUTOMATIC SHIFT?

Yes sir, that's just what we said. And scaled down in size to produce the smallest stripper well too. That's why we call it the STRIPPERMATIC.

Until recently, we thought our 1-1/16" Bore Petrol "A" pump was about as small as any commercial oil well needed, but operators showed us any number of profitable stripper wells that would pound fluid in thirty minutes with a 1-1/16" pump.

So the STRIPPERMATIC was born. It's a compounded two stage pump. When the fluid is there, it pumps with a 1-1/16" displacement. When the level drops, the full 1-1/16" bore merely serves as a charging pump for the second stage annular chamber, and this is equivalent to a mere 5/8" bore pump. When this automatic shift takes place, there is a drop in load range on the sucker rods, the torque drops on the unit, and the power consumption goes down. Gas lock is eliminated by the two stage construction so both production and pump life are improved.

All this pump for less than two hundred dollars? Yes sir, even the initial cost will appeal to a stripper operator. If you have a small well that can use a versatile pump like this, or need its big brother, the Ratio-Compound for pumping foamy or gassy oil, or for pumping under a packer, contact your nearest OILMASTER representative . . . there's one close by.

STRIPPERMATIC

. . . the new 2 stage pump for the smallest stripper wells

oilmaster PUMPS

FOREMOST IN THE INDUSTRY

FLUID PACKED PUMP COMPANY

Main Office and Plant, Los Nietos, Calif.

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control medium. This makes the unit compact and simple to install where space is a problem. Remotely controlled, this regulator can be installed at any point in the air system. The pilot regulator can then be installed in a convenient location for easy adjustment of working pressure. **For more information write or call: C. A. Norgren Co., 3400 South Elati, Denver 9, Colo.**

•

Bulldozer Stumper Provides Quick Hookup to Blade

Attachable to any bulldozer blade from 35 to 51 in. in height, the Model R100 stumper features a positive-clamping device which permits its being mounted or dismounted in a matter of minutes, freeing the bulldozer for gathering stumps. No alterations to the bulldozer blade are required. The new three-prong stumper has replaceable manganese teeth.

The Model R100 permits the concentration of the power of the tractor and the lifting force of the bulldozer blade at the base of the stump, resulting in quick removal of the stump with a minimum effort. Soil around the stump need not be disturbed. **For more information write or call: The Ransome Corp., 2729 Hunting Park Avenue, Philadelphia 29, Pa.**

•

Rectifier for Cathodic System Draws Low Current

Field-tested, a new silicon-type rectifier offers efficiency and long life in rectification of alternating currents in the petroleum industry. The rectifier cuts down power requirements in cathodic-protection systems. **For more information write or call: Cathodic Equipment Co., Inc., 4019 East Eleventh Street, Tulsa, Okla.**

Oil and Gas Journal Showcase

.....OF NEW EQUIPMENT

Four-Place Plane Cruises at 200 M.p.h.

Named the Badger, the Model 95 four-place twin-engine executive airplane with a cruising speed of approximately 200 m.p.h. is powered by two 180-hp. Lycoming engines. The new airplane is now undergoing a fast flight-service test program to assure deliveries as early as possible in 1957. This new model adds a fourth executive-type airplane to the line of Beech executive planes. The Badger is designed for the corporation or buyer who needs a small twin-engine business plane. **For more information write or call: Beech Aircraft Corp., Wichita, Kans.**

•

Mastic Retards Fire, Insulates, and Rustproofs

A resinous compound, this heavy-bodied black mastic will insulate a metal surface against reaching 1,000° F. for 30 minutes while being subjected to 2,000° F. flame. The fire-retardant, a heavy-bodied black mastic, was developed primarily as a fire and heat-retardant coating for metal vessels, equipment, and for structural supports but has other applications.

In addition, the mastic serves as an interior or exterior coating to insulate, reduce condensation, rustproof, and waterproof in the range of —20° F. to 250° F. It weathers well, withstands acid and alkali fumes and splash, and will not support mildew. **For more information write or call: Insul-Mastic Corp. of America, 7750 West Sixty-First Place, Summit, Ill.**

Oil and Gas Journal Showcase Coupon

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OIL AND GAS JOURNAL *Showcase* OF NEW EQUIPMENT

Proportioner-Meter Unit Maintains Ratio to Flow

This new proportioning and metering system provides an over-all accuracy of 2 per cent plus or minus over range of flow from 100 to 10 per cent of rated capacity for equipment used.

The proportioner component maintains chemical feed in proportion to flow and affords a measurement of flow on the linear scale, requires no electrical connections in the venturi pit or pipe gallery, and allows the transmitter to be installed at any distance up to 500 ft. from the differential producer.

The electrically operated meter records, indicates, or totalizes the flow, or combines any two or all three of these functions. Since the actuating signal from the ATI transmitter is in direct proportion to the flow rate, the indicator and chart divisions of the meter have equal spacing, and the integrator sums the flow directly. **For more information write or call: Infilco, Inc., 901 South Campbell Avenue, Tucson, Ariz.**

STEEL "on tap"

for Oil and Gas Industry

When you need steel quickly—whatever the kind and quantity—here's your surest source. Here you draw on the world's largest steel stocks; have at your disposal every kind of equipment for preparing steel to your order. And experienced steel men who know your industry's requirements work with you. So for quick, dependable steel service . . .

call RYERSON

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA CHARLOTTE, N. C. • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Vertical-Shaft Motor Line Offers 1 to 10 Hp.

Available from 1 to 10 hp., this newly designed vertical solid-shaft motor conforms to dimensional standards recently adopted by N.E.M.A. Designated as Uniclosed, Type HV, this motor is furnished with a N.E.M.A. Style C or Style P base. Type HV vertical-shaft connection for directly applied power simplifies hookup and unitizes the motor with the driven machine. This insures positive alignment and quiet operation.

To insure efficient operation and lubrication of ball bearings, the Lubriflush system provides a large volume of fresh grease to surround the bearings. By injecting the grease transversely through the bearing, the old grease is completely purged. Complete lubrication may be accomplished at any time without disassembly of the unit. **For more information write or call: U. S. Electrical Motors, Inc., Box 2058 Terminal Annex, Los Angeles 54, Calif.**

•

Instrument Tells Pipeline Contents Without Sampling

By measuring the index of refraction, the Indexometer electronically determines pipeline contents without sampling. The Indexometer indicates the index of refraction on a wide scale meter. It operates under any pressure or temperature; on liquids that are opaque, clear, or translucent, reflective or nonreflective; with or without suspended solids, water, or entrained air; and on gases. The instrument can be calibrated to show a range of refraction indices or zero center on a single index and show plus or minus deviations from this.

It does not interfere with or con-

Complete hydraulic service... from one dependable source...

DENISON

FREE APPLICATION ENGINEERING by experienced hydraulics specialists to improve your circuits.

JOB DEMONSTRATIONS to *prove* how your operations can be made more efficient with the new hydraulic developments.

REGIONAL FACTORY SERVICE includes *complete maintenance facilities* for building, testing, repairing equipment.

OVER-THE-COUNTER SALES from local stock to give you *immediate delivery* of hydraulic pumps, motors and controls.

Behind the name Denison... With its regional warehouses and branch offices, Denison's factory service is now as near as your telephone. Specialists in hydraulics are immediately available to help you build a better product, build it for lower cost.

Regional Warehouses in Chicago, Houston, Los Angeles, Clark, New Jersey. Branches in every principal city.

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DENISON HydrOILics

HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS

taminate the process it monitors, and can be easily removed for cleaning or maintenance. It operates any type of commercial recorder and can be made explosionproof. The Indexometer operates at 1,500 psi. **For more information write or call: Industrial Gauges, West Englewood, N. J.**

New Jet-Perforating Method Leaves No Slugs

Now in the field ready for service, a new jet-perforating method leaves no copper slugs or carrots. Removing this slug opens the way to greater production by improving the drainage flow from the formation.

Recent laboratory tests made of a new jet-perforating charge resulted in a penetration of 3.7 in., with an entrance diameter of ⅜ in., and left the perforation free of the customary plug. This completely clean hole is made possible by internal diffusion of the charge debris inside the gun body.

The Rocket J-II has been completely redesigned. The case, the copper liner, and the molding of the explosive behind the liner have all been altered to produce a completely new shaped charge. The combination of these changes, along with the spring-loading principle, resulted in a perforation free of carrots and other debris to total depth of penetration. In addition to leaving the hole free, the new charge eliminates trapping of carrot in the gun. **For more information write or call: The Western Co., P. O. Box 310, Midland, Tex.**

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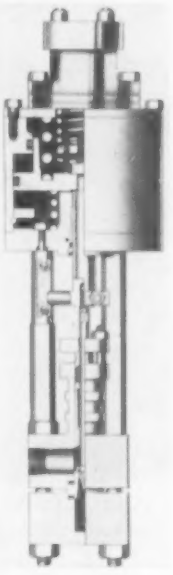
Valves Offer Small-Flow Control at High Speed



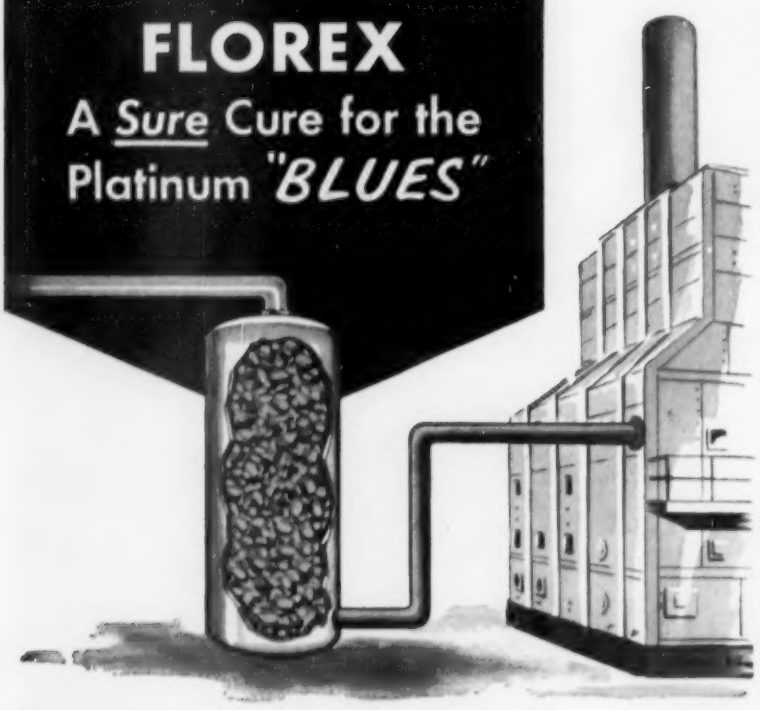
Designed for working pressures of 6,000 psi., a new series of valves provides high-speed and responsive small-flow control. Model 9460 features use of No. 600 series differential area Do motor operator. The differential-area piston eliminates need for loading regulator and will stroke fully in either direction in 0.75 second or less. The line offers open-on-air-failure or close-on-air-failure action. **For more information write or call: The Annin Co., 6570 East Telegraph Road, Los Angeles 22, Calif.**

•

Electrode Designed for All-Position Pipe Welding

Designed especially for all-position pipe welding, the new Fleetweld 5-P electrode is suitable for all A.W.S. E-6010 applications, but is especially designed for pipe welding. The electrode provides smooth arc operation, deep penetration, and good bead washin. It also offers minimum slag interference.

FLOREX
A *Sure* Cure for the Platinum "BLUES"



The growing use of platinum catalysts in reforming feed stock emphasizes the importance of pre-removing trace metals such as arsenic, lead and sulphur compounds. Platinum catalysts are poisoned by these substances in quantities even as small as ten parts per billion.

Treating the feed stock before the trouble occurs, Florex adsorbent provides the simplest, most economical means to protect expensive catalysts. Florex in the granular grades will completely remove or reduce these compounds to a harmless level.

Recognized throughout the world as superior to all other natural clays, Florex is prepared from carefully selected Florida Fuller's Earth by a special processing, including high pressure extrusion.

Meshes from 8/16 and up are customarily used. Write for information today.

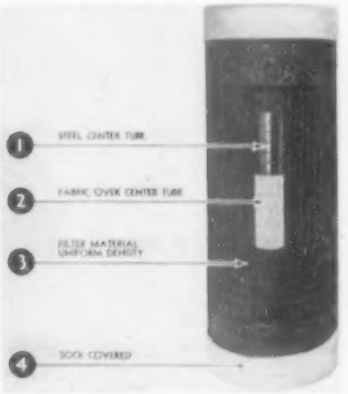
FLORIDIN COMPANY
Adsorbents
Desiccants
Diluents

Dept. C. P. O. Box 989 Tallahassee, Fla.

resulting in quick freezing of the molten metal and less tendency for windows and porosity. The electrode produces a flat-shaped bead in an even deposit from which slag is easily removed.

Fleetwood 5-P can be used for welding pipe, pressure vessels, X-ray applications, and other A.S.M.E. code work. It also is suitable for all-position structural welding and machinery weldments. **For more information write or call: The Lincoln Electric Co., Cleveland 17, Ohio.**

■



Filter Removes Particle Sizes Down to Five Microns

Made of Tuflite, this filter permits a high flow rate and low pressure drop and removes particle sizes down to 5 microns.

Tuflite is a new filter material consisting of graded cotton fibers felted into sheets and impregnated with a thermosetting plastic resin, which is not soluble in oil or water. This allows the filter to be used for fine filtration of all types of lubricating, fuel, and industrial oils, and many aqueous solutions such as coolant compounds. **For more information write or call: The Hilliard Corp., Elmira, N. Y.**

■

Bactericide Stops Sulfide Plugging of Formations

Used in water-flooding operations, a new bactericide is helping to solve problems created during the secondary recovery of oil. It is called glutaraldehyde, a derivative of acrolein. In concentrations as low as 5 p.p.m. this light-colored liquid kills bacteria known as desulfibrio desulfuricans, which reduce sulfates to sulfides. Sulfides corrode equipment and plug formations.

"Flexite" plungers are easily made up in the field

HARBISON-FISCHER • FORT WORTH

Best Plungers in the Oil Patch"

H·F

Harbison-Fischer Flexite Ring Plungers can be quickly assembled without special jigs, special tools, or special skills. Lease men like Flexite pumps also because the rings can be made up onto any length plunger, no soaking or pre-fitting is necessary, and they will not swell or corrode. Flexite rings are machined — like metal — from a tough plastic composition impregnated with graphite for lubrication. A step cut in the side allows them to expand or release with the fluid load; this makes a good seal on the upstroke and lets the rods fall freely on the downstroke. Flexite plungers are available for all A.P.I. rod and tubing pumps. Check with another pumper or ask at your store. They'll recommend Flexite also.

OIL AND GAS JOURNAL *Showcase* OF NEW EQUIPMENT

Ease of handling makes this chemical especially attractive. Not only is its odor pleasant, it is shipped in drums in water solution ready to be added directly to the water supply as it floods the oil field. A tap may be attached to the drum permitting an operator to set up at once an automatic drip feed into his water system that requires attention only when the drum is to be replaced. **For more information write or call: Carbide & Carbon Chemicals Co., 30 East Forty-Second Street, New York 17, N. Y.**

●

Start Pilot Gives Quick Starts to Cold Engines

Start Pilot is a permanently installed device which provides quick starting for gasoline and diesel engines. This device injects a small quantity of ignition-promoting fluid as a fine spray, mixed with air, into the engine intake manifold. This supplies quick starts, even at temperatures as low as —60° F.; saves engine wear, lengthens battery life; and keeps the engine firing

until the regular fuel source can sustain combustion. **For more information write or call: Wilco Co., 4425 Bandini Boulevard, Los Angeles 23, Calif.**

●

New Magnetometer Saves Survey Time, Labor Costs

Used for ground surveys in petroleum exploration, the Sharpe A-2 vertical force magnetometer is a one-man instrument which does not require an assistant field operator because the orienting compass is permanently mounted on the instrument. The instrument offers sensitivity as fine as 10 gammas per scale division. Total weight, including tripod, is 13 lb. **For more information write or call: Geophysical Instrument & Supply Co., 1201 Broadway, Denver 3, Colo.**

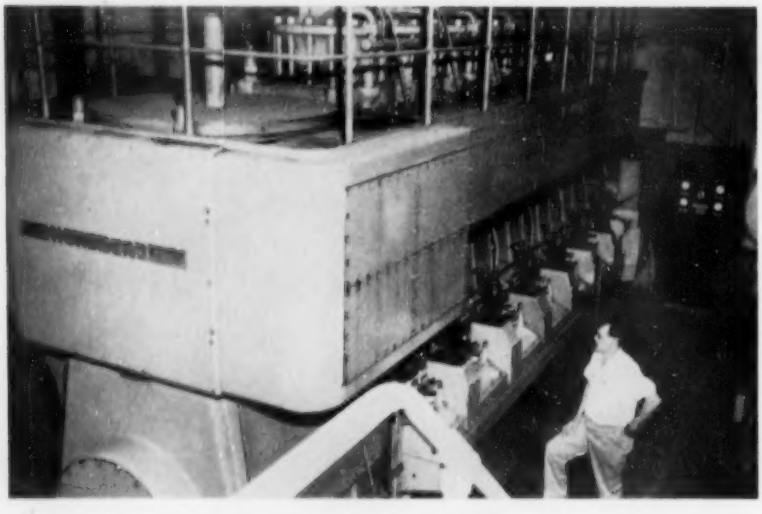
●

Telemetering System Computes Fluid-Flow Values

A new system of telemetering instruments totalizes several flow measurements; corrects for such factors as temperature, pressure, specific gravity and supercompressibility in fluids; and provides a corrected flow value.

Available in other types, these instruments perform averaging, totalizing, multiplying, and dividing computations involving basic measured variables. In addition, systems which will extract square-root values, obtain the square of the reading, or compensate for a particular mathematical law can be supplied. **For more information write or call: The Bristol Co., Waterbury 20, Conn.**

Look to COOK for Better Rings!



Cook rings save $18 per day on one 2400-hp Diesel engine

WHEN a switch was made to Cook Piston Rings, Key West Electric's No. 12 Diesel showed a saving of $41,670, for 55,542 operating hours — *an average saving of $18 per day!*

There are good, built-into-the-ring reasons why a switch to Cook almost inevitably leads to more efficient performance, more dollar savings. Cook rings are returned as a final manufacturing process . . . they're light-tight, conform perfectly to the cylinder wall. This prevents scuffing and power-stealing blow-by. Also, Cook rings are tensioned by a unique, gentle "squeezing" process. Result: constant, uniform tension that *never* wears out.

Get all the facts on this $41,670 saving.

Get complete operating data showing exactly how Cook piston rings compared dollar-for-dollar with "X" brand rings.

Write for the Key West Electric Story, C. Lee Cook Company, 994 South 8th Street, Louisville 3, Kentucky.

C. LEE COOK COMPANY

Rings and Packings Since 1888

It takes a complete team to keep dependable drilling mud service available for you

Meet this Magcobar Man, the mud engineer... he's a good man to have on your drilling crew

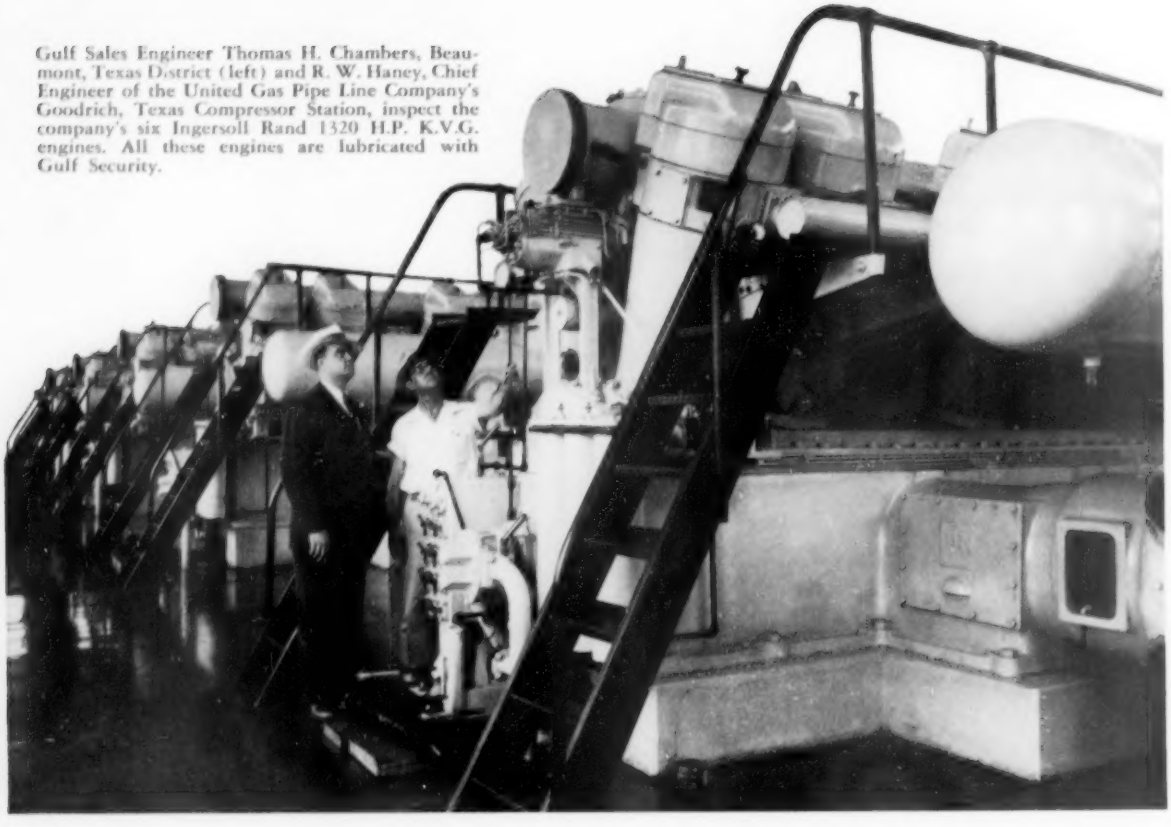
The Mud Engineer is the member of the Magcobar team who gives you prompt, accurate laboratory analyses of mud at the well. His skill, knowledge, training and experience are at your command wherever you drill on the North American Continent. Trained and paid by Magcobar, this man actually works for you at your well.

When you have a mud problem your Magcobar Mud Engineer, with the entire Magcobar organization behind him, is the man to call. He'll be there anytime day or night.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION

Houston, Texas



Gulf Sales Engineer Thomas H. Chambers, Beaumont, Texas District (left) and R. W. Haney, Chief Engineer of the United Gas Pipe Line Company's Goodrich, Texas Compressor Station, inspect the company's six Ingersoll Rand 1320 H.P. K.V.G. engines. All these engines are lubricated with Gulf Security.

Lock out high maintenance costs in your gas transmission plants

with GULF SECURITY

Gulf Security's outstanding record in the lubrication of pipeline gas engine compressor units is your assurance of smooth, continuous operation. In scores of gas transmission plants this high quality straight mineral oil helps prevent operating troubles and contributes to low maintenance costs.

Gulf Security is a non-additive oil that does not cloud liquid filled lubricators of power cylinders, compressor cylinders, and packing glands. After years of operation with Gulf Security, cylinders and piston rings of both compressors and power assemblies show negligible wear, and its excellent oxidation stability helps prevent the formation of acid and resins in the crankcase system.

Make certain your units receive safe, effective lubrication protection—specify Gulf Security. And remember that Gulf provides the services of a trained, experienced petroleum expert—the Gulf Sales Engineer—to help you with any problem involving a petroleum product. Consult the telephone directory for the number of your nearest Gulf office.

GULF

Gulf Oil Corporation • Gulf Refining Company
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THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Rigid Koroseal Pipe. Containing eight, two-color pages, this illustrated brochure explains how high-impact rigid Koroseal pipe is installed, reviews products applications, and describes physical properties. Catalog 10050 also describes the use and installation of Koroseal valves. The back page is devoted to a chart listing common chemicals handled by Koroseal pipe, fittings, and valves. **For more information write or call: B. F. Goodrich Co., Plastic Products, Marietta, Ohio.**

●

Nasul Technical Data Sheets contain information on a corrosion inhibitor for use in distillate fuels. Government approved as an additive in fuel for turbine, jet, and reciprocating aircraft engines, this inhibitor requires no special equipment for handling or blending. The data sheets present properties, laboratory and engine test results, and compositions. **For more information write or call: R. T. Vanderbilt Co., Inc., 230 Park Avenue, New York 17, N.Y.**

●

The Dravo Ram Towboat. Described in a new four-page illustrated folder, the Ram class, 70-ft., diesel-powered towboat works in a variety of inland-waterways operations. Bulletin No. 250-128 contains information for marine engineers, barge-line operators, and other officials interested in economical waterway operations involving medium and short-haul towing, oil transportation, and marine construction work. Photographs in the folder show the 580-hp. Ram in operation. **For more information write or call: Dravo Corp., Neville Island, Pittsburgh 25, Pa.**

●

Wilson Tube Expanders. Of interest to men responsible for maintenance or manufacture of boilers, condensers, evaporators, or heat exchangers, Catalog 88 details information about tube expanders and associated tools used for tube rolling. The well-illustrated catalog, containing 119 pages, offers sections devoted to expanders, general accessories, measuring instruments, rollers, extensions, and drives. In addition, the catalog features information on tube-expansion methods, tool maintenance, expansion calculations, and charts giving pipe and tube sizes. **For more information write or call: Thomas C. Wilson, Inc., 21-11 Forty-fourth Avenue, Long Island City 1, N. Y.**

●

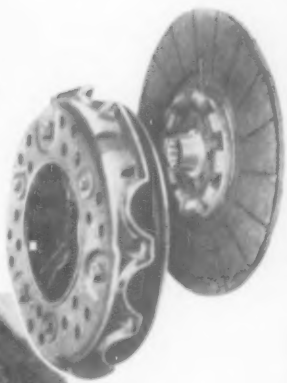
Buyers' Guide to Corrosion-Resistant Process Equipment. Directed to the petrochemical and chemical industries, this guide, Bulletin 936, lists project-engineering facilities for designing a complete new operation or for revamping an existing process. It also gives information on custom-built process equipment, glassed-steel reactors, alloy reactors, columns, heat exchangers, and condensers, evaporation equipment, storage, mixing and trailer tanks, and standard accessories for all of these pieces of equipment. **For more information write or call: Pfaudler Co., 1017 West Avenue, Rochester, N. Y.**

●

Hi-Rate Pressure Filter. A new four-page, two-color bulletin describes the operation and advantages of this completely new high-capacity filter. Bulletin 9200 also contains a typical layout diagram, a cutaway wash drawing of the unit, and photograph of the initial installation. Designed specifically

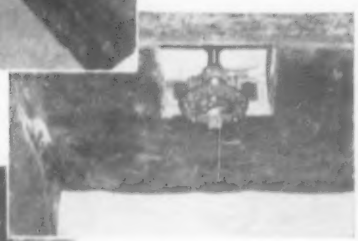
ROCKFORD

Clutches Are Spin Strength Tested to Meet The Needs of Modern High Speed Engines



First they are put in a deep, armor-plated, concrete test pit.

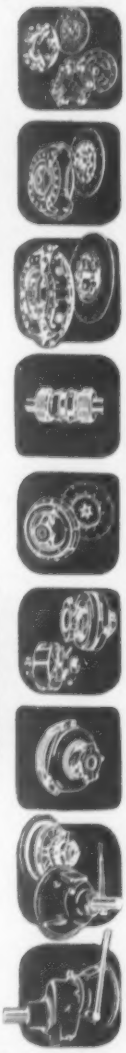
Then fastened on a shaft that spins the clutch at high speed.



The clutch is spun, and highest R.P.M. recorded.

Let us help insure fully-tested clutches for YOUR products.

ROCKFORD
Clutch Division
BORG-WARNER
1301 Eighteenth Ave., Rockford, Ill.



CLUTCHES

No Gears! No Teeth!

The gage of enduring accuracy

HELICOID Gages—without gears or teeth—last longer in rugged gage service because they eliminate the major sources of gage trouble. There can be no wearing and fouling of teeth or excessive play between teeth because there are no gears, no teeth in HELICOID Gages.

No expense has been spared in extensive research, engineering and testing equipment to produce this outstanding pressure instrument—a gage of the utmost precision and enduring accuracy.

HELICOID Gages are available for practically every type of installation and service—in many sizes and many styles—for pressure, vacuum or compound service. Furnished in a full range of pressures; all with the HELICOID stainless steel movement.

Write today for the HELICOID Gage Catalog

1 Stainless Steel HELICOID Roller (no gear teeth).
2 Stainless Steel Hair Spring.
3 Long Life Cam (no gear teeth).
4 Corrosion-resistant Link and Screws.

ACCO

Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-A Connecticut Avenue • Bridgeport 2, Connecticut

for Better Value

for high-capacity water filtration with emphasis on secondary-recovery operations in the oil fields, the Hi-Rate pressure filter is basically a leaf-type unit using some form of precoat material. Capacities average between 1.0 to 1.5 gal. per minute per sq. ft. of filter area (20-hour cycle). **For more information write or call: Dorr-Oliver Incorporated, Barry Place, Stamford, Conn.**

•

Baroid Distributors. Using 3 colors and 16 pages, this booklet lists Baroid drilling-mud distributors throughout 27 states and Canada. The brochure employs seven colored maps to show the stockpoints. The maps and lists designate bulk facilities, subdistributors, and water points. **For more information write or call: Baroid Division, National Lead Co., P. O. Box 1675, Houston 1, Tex.**

•

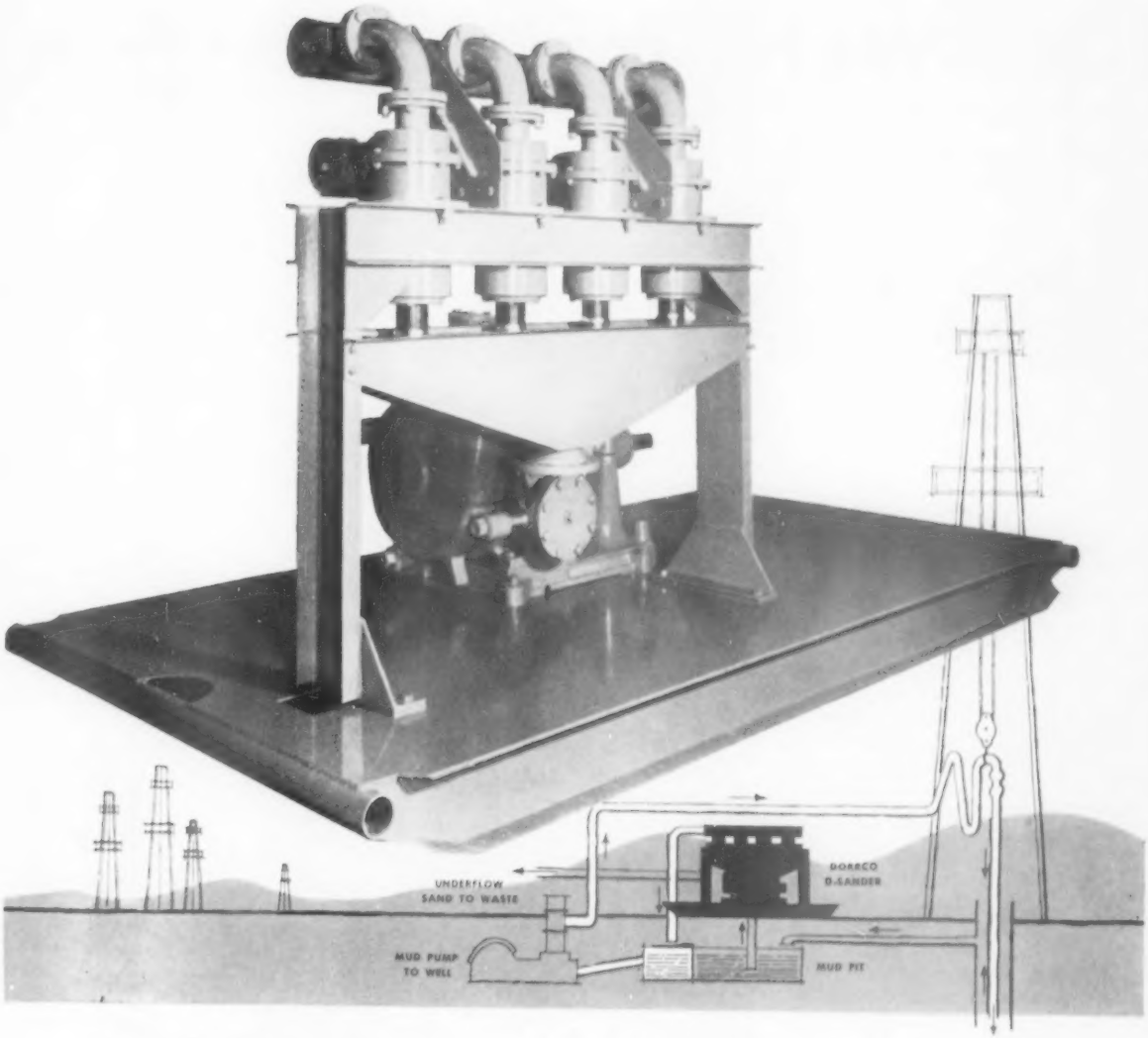
Columbian Bolted-Steel Tanks. Listed as Catalog 656, this brochure features a pictorial description of the use and application of new synthetic gasket materials in the erection of bolted-steel tanks. The catalog contains a table of A.P.I. dimensional specifications for the more important sizes of bolted-steel tanks from 100 to 10,000-bbl. capacity. It also pictures tank accessories, such as walkways, stairways, hatches, and ladders. **For more information write or call: Columbian Steel Tank Co., Box 4048, Kansas City, Mo.**

•

National Torque Converters for Heavy Industrial Services. Including photographs and a capacity chart, this six-page folder describes the application of heavy-duty, single-stage hydraulic torque converters for transmission of 100 to 1,000 hp. to drilling-rig operations. Bulletin 468 gives features and specifications of 17 sizes and capacities of torque converters for exact matching with engines in this power range. **For more information write or call: National Supply Co., 2 Gateway Center, Pittsburgh, Pa.**

•

Applications of the Vibraswitch to Pumping Stations. Containing memoranda of experiences of pipeline companies, this field report relates incidents wherein pumping-station equipment had been saved from serious damage by early detection of trouble with vibration-detection instruments. Noting specific experiences, the memorandum sheet points out the increasing use of such protecting equipment. **For more information write or call: The Beta Corp., Box 8625, Richmond 26, Va.**



SIMPLIFIED MUD CONTROL

...with New Dorrco D-Sander

Solids build-up in drill muds is often aggravated by accumulation of hard-to-remove fine silty sands. This problem was solved in the Texas Panhandle by using a design variation of the proven Dorrco D-Sander. The new D-Sander, engineered specifically for *fine* or flour sand operations, will remove essentially all API sands and fine abrasive particles larger than 30 Microns. By removing undesirable solids from the drill mud system, mud weights can be closely controlled and aid in prevention of lost circulation.

In addition to maintaining lower mud weights, the Dorrco D-Sander will also reduce rig drill time, the number of bits used per well, and mud pump repairs.

U. S. Sales Representative for the Dorrco D-Sander: Salt Water Control Inc., 1211 Fort Worth National Bank Building, Fort Worth 2, Texas.

D-Sander is a Trademark of Dorr-Oliver Incorporated. Reg. U. S. Pat. Off.

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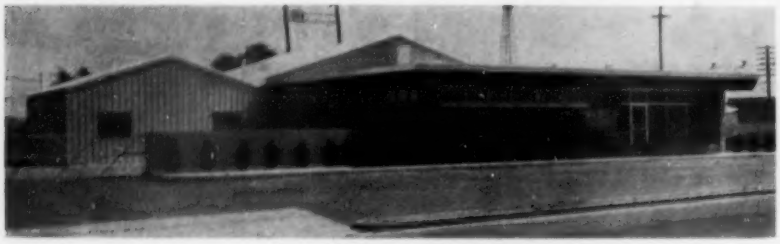
EQUIPMENT MEN . . . in the News



Demco Completes Plant and Office-Building Expansion

The recent completion of a plant and office-building expansion has been announced by Drilling Equipment Manufacturing Co. of Oklahoma City. Construction was begun during the latter part of 1955. The 4,500-sq. ft. building includes a modern reception center and executive and general offices. A new plant building has also been erected and the entire plant facilities have been rearranged to provide for greater efficiency of production. Several new machine tools have been placed in operation, also. Due to the new facilities and the added space, Demco has increased production capacity approximately 30 per cent.

BJ Promotes File to Rocky Mountain Post

O. J. FILE

O. J. File has been promoted to Rocky Mountain assistant regional manager for Byron Jackson Oil Tools, Inc., a subsidiary of Borg-Warner Corp., it has been announced by V. C. Horner, vice president and manager of sales. File will be headquartered in Denver, assisting J. P. Magoffin, regional sales manager.

File previously was district manager for Oklahoma and Kansas. He joined Byron Jackson in 1936, working at the company's office and plant in Los Angeles and as a sales representative in Bakersfield and North Texas prior to serving in Oklahoma.

Foster Cathead Appoints Gill as Representative

Bobby W. Gill was recently appointed representative for Foster Cathead Co. in the North Louisiana, East Texas, Arkansas area. Gill has his headquarters in the Tri-State Specialty Building, Shreveport.

Gill has been with Foster Cathead of Wichita Falls, Tex., for the past 4 years. He served first as shipping and receiving clerk, and later as parts department manager, and factory and field service man, for both catheads and tubing tongs.

Koenig Names Howe As Sales Manager

W. S. HOWE

William S. Howe has been named sales manager for domestic and foreign operations of Koenig Iron Works, Inc., Houston. The appointment was announced by Herbert Koenig, vice president of the firm that makes King winches, all-steel cabs for Jeeps, standard and specially designed utility and truck bodies and wrecker accessories.

Howe came to the Koenig organization from Toledo, Ohio, where he held an executive sales position with Willys Motors.

Portland Warehouse-Office Opened by Midwestern

Announcement has been made of the opening of a new branch office and warehouse in Portland, Ore., for Midwestern Pipe Line Products Co., Midwestern Engine & Equipment Co., Inc., and Midwestern Manufacturing Co., all of Tulsa, according to O. E. Murrey, president of the three allied companies. The new office will be headed by E. J. Spradlin as sales-service representative. Spradlin was formerly attached to the firm's Oklahoma City office.

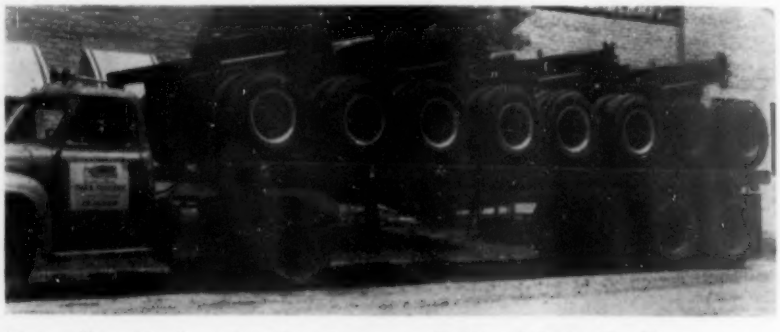
The Midwestern companies are distributors of pipe-wrapping materials and pipeline-construction equipment, with offices in Houston, Atlanta, Pittsburgh, Oklahoma City, and Mount Prospect, Ill.

Bovaird Promotes Moore to City Sales Representative

F. D. MOORE

Foreman D. Moore has been promoted to city sales representative of Bovaird Supply Co., according to T. C. McCuistion, assistant sales manager for Bovaird.

Moore, formerly chief clerk of the machinery department, joined Bovaird in 1951 and has been handling machinery quotations and engineering. His new position involves the sale of the complete line of machinery, equipment, pipe and supplies.



Canadian Project to Use Spencer-Safford Pole Trailers

Sale of 18 pole trailers to Roy F. Parkhill, Tulsa, one of the nation's leading stringers of pipeline, has been announced by officials of Spencer-Safford Loadcraft, Inc., Augusta, Kans. The importing was handled through the retail truck branch of General Motors at Toronto, Canada. The 40,000-lb.-capacity units were equipped with the Spencer True-Beam axle and Spencer double pivot tandem. Parkhill purchased the trailers for use on the Alberta Winnipeg leg of the Trans-Canada Pipe Line, Ltd., $378,000,000 natural-gas pipeline project.

Clark Flies Executives to Olean for Turbine Preview

Nineteen executives of oil companies were guests of C. J. Michelson, Tulsa district manager, Clark Brothers Co., on a trip to Olean, N. Y., home office and plant of this Dresser Industries manufacturer.

The oil-industry men were taken to Olean to preview the new 1,130-hp. Mark TA gas turbine recently licensed to Clark Brothers by Ruston-Hornsby, Ltd., England. (The Oil and Gas Journal, August 6, page 64.) Clark personnel and guests shown leaving the Tulsa airport are: Kneeling, C. J. Michelson, Clark Brothers; C. R. Childress, Sinclair Oil & Gas Co.; R. L. Lane, Warren Petroleum Corp.; and Earl Stokes, Phillips Petroleum Co. Second row standing are: H. E. Doyle, Phillips Petroleum; H. L. Hays, Phillips Petroleum; M. J. Peterson, Oklahoma Natural Gas Co.; J. F. McCarthy, Clark Brothers; J. A. Middleton, D-X Sunray Oil Co.; W. A. Allen, Phillips Chemical Co.; and D. A. Roach, Phillips Petroleum. On the steps and reading upward from left to right are: J. E. Mallow, Phillips Petroleum; I. C. Miller, (without hat and partially hidden), Colorado Interstate Gas Co.; W. A. McCarthy, Phillips Petroleum; C. L. Seyer, Phillips Petroleum; L. E. Shultz, Phillips Petroleum; D. M. Hefner, Phillips Petroleum; Aubrey Weatherholt, Cities Service Oil Co.; L. M. Mauney, Warren Petroleum; Robert Spikes, Pioneer Natural Gas Co.; and J. E. Johnston, Oklahoma Natural Gas Co.

Sales and Field-Service Appointees Named by Totco

John A. Castleberry is a new member of Technical Oil Tool Corp.'s sales staff in the Gulf Coast division and N. E. (Gene) Holbrook has joined the field-service staff in the West Texas area, according to H. H. Peters, president of Totco.

Castleberry will cover the Houston and El Campo areas of the Houston office under the direction of Division Manager R. L. O'Rear. Castleberry has had several years of oil-field sales experience. Holbrook will be stationed at Odessa, Tex., and will operate under the direct supervision of Hugh Weathersby, Totco West Texas-New Mexico division manager.

Gas-Lift Firm Acquired By Otis Engineering

Otis Engineering Corp., Dallas, manufacturing affiliate of Otis Pressure Control, Inc., has announced the purchase of Cummings, Inc., Houston, manufacturers and distributors of gas-lift valves.

H. C. Otis, president of the Otis companies, said that all Cummings employes, including Les L. Cummings, the Houston firm's president, would be retained in the Otis organization. Cummings has been named manager of the gas-lift division for Otis in Houston.

Otis purchased all of the patent rights of the Cummings firm and plans to manufacture, market, and service the gas-lift equipment under the Otis name.

Cummings is the second gas-lift firm Otis has acquired in the past 3 months. In May the company purchased Bryan Gas Lift Equipment Co. of Fort Worth.

Ray Faulk Named Export Manager by H. C. Smith

RAY FAULK

Appointment of Ray Faulk as export manager for H. C. Smith Oil Tool Co. has been announced by Arthur S. Marshall, vice president, sales.

Faulk joined the company in 1946 as a sales representative in its Ventura, Calif., division. In 1948 he was appointed branch manager for the Fillmore, Calif., division, a position he has held for the past 8 years.

Bethlehem Promotes Nelson

H. G. Nelson, formerly field representative at Bethlehem Supply Co.'s Corpus Christi store, has been promoted and transferred to Alice, Tex., as store manager and field representative.

Alexander Reorganizes Into American Marine Corp.

Alexander Shipyard, Inc., of New Orleans in the future will be named American Marine Corp., with a reorganization and expansion program designed to meet the increasing shipbuilding and marine servicing needs of the Gulf Coast area.

The president of the new American

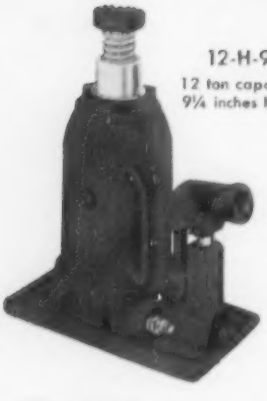
View of American Marine Corp.'s yard No. 2, showing two deep-water drilling giants designed and constructed by American Marine.

These Modern Jacks Can Lift Heavier Loads With Less Effort!

30-H-11
30 ton capacity
11 inches high

50-H-11
50 ton capacity
11 inches high

12-H-9
12 ton capacity
9¼ inches high



3-H-9
3 ton capacity
8½ inches high

These precision built jacks require much less effort to operate than mechanical type jacks because they utilize the hydraulic principle—a pump does the work.

Duff-Norton Hy-Power Hydraulic Jacks, because of this ease of operation, are finding more widespread use in the oil fields for all kinds of heavy lifting and pushing jobs. They are standard equipment on many rig builders' trucks and on drilling rigs.

There are ten Duff-Norton Hydraulic Jacks with capacities from 3 to 50 tons. All models can be equipped with gauges calibrated to show exact weight of load being lifted.

See these time and energy saving hydraulic jacks at your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks for complete specifications. Ask for Hy-Power Hydraulic Jack Bulletin AD16-B, Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON *Jacks*

"Giving Industry A Lift Since 1883"

Marine Corp. is Leslie B. Durant, formerly vice president and general manager of Alexander Shipyard, Inc. H. E. Breit, Jr., for many years chief engineer, is vice president of the reorganized company. Joining the staff as assistant vice president is W. H. Michel, formerly in charge of research and development with Gibbs & Cox, Inc., naval architects of New York City.

According to Durant, an expansion program is in progress with the recent additions of a new gas-freeing plant, a 1,500-ton floating dry dock, a 50-ton floating derrick, and a new 16-ft., 600-ton hydraulic press for the forming of steel plates. Nearing completion is a unit for Ocean Drilling & Exploration Co., comparable to its Mr. Charlie and John Hayward, both built by Alexander Shipyard. A similar deep-water rig is under construction for Delta Marine Drilling Co., while a third unit will soon be under way for unannounced interests.

Grady Becomes Dallas Manager for Halliburton

J. E. Grady has assumed duties as district manager of electrical well services in Halliburton Oil Well Cementing Co.'s Dallas division. Grady has been with Halliburton 7½ years and was formerly located in Oklahoma City, where he served as EWS sales engineer.

Oilwell Makes Gulf Coast And Eastern Area Changes

The transfer of William H. Hiatt, district engineer, machinery and equipment sales, for U. S. Steel's Oil Well Supply Division, from Lake Charles, to New Orleans, La., appointment of Rudolph L. Wiley as manager of the New Iberia, La., store, and promotion of Clinton B. Richey to field representative at Victoria, Tex., have been announced by M. F. Jones, manager of Oilwell's Gulf Coast area. Thornton D. Krudwig, field engineer at Fairfield, Ill., has been named field representative at that location, according to C. H. Maynard, manager of Oilwell's eastern area.

Hiatt, who was employed in 1948 as an engineer trainee, has served as assistant district engineer at Beaumont, Tex., and Lake Charles, and in 1952 was appointed district engineer, machin-

ery and equipment sales, at Lake Charles. Wiley joined Oilwell in 1953 at Harvey, La., and became field representative there in 1956.

Richey joined Oilwell in 1952 at Alice, Tex., and transferred to Corpus Christi, Tex., the following year. Krudwig came to Oilwell in 1951 as a field engineer. He was transferred to Fairfield in the same capacity in 1952, holding that post until his latest assignment.

Schlumberger Names Davis

The new field sales engineer for Schlumberger Well Surveying Corp.'s southern Rocky Mountain division is Donald G. Davis. His headquarters are in Denver.

Davis joined Schlumberger in 1950 and has served as field engineer in several Rocky Mountain locations.

Giant Orifice Fitting Is One-Man-Operated

Standing over 8 ft. high and weighing 5 tons, this Commercial Type CS is the largest orifice fitting ever built which can be operated by one man, according to Claude Welcome, president of Commercial Iron Works, Los Angeles, builders of the fitting.

This giant 30-in., 600-lb. A.S.A. fitting will be installed in a transmission line for delivery of gas from Texas and New Mexico to California. At maximum capacity, operating on 1,440-psi. line pressure, it is capable of metering 1¼ billion cubic feet of gas per day.

The 4,600-lb. upper chamber swings out smoothly by turning the handwheel. No ladders or platforms are required as the crank-operated orifice plate carrier is lowered on its nonrising stem to within easy reach of the operator. Due to its chambered construction and the lubricant sealed plug valve, the fitting may be serviced and the orifice plate changed under line pressure. Location of the orifice disk midway of the fitting simplifies installation, as direction of flow is not a factor.

This hoist is the most efficient lightest, safest hoist in its capacity class available today!

The Coffing Super Power

It's an exclusive Coffing-designed coil chain hoist using patented, compound hardened alloy steel levers instead of bulky, heavy gears. It's more efficient (85%), more compact, with the greatest power-to-weight ratio and the highest safety factor (5) of any ratchet lever hoist yet invented. Available in 6 models from ¾ to 5 ton capacities. Model RG coil chain hoist available in ¾ ton.

"Safety valve handle" bends at point of maximum safe overload—may be adjusted for length and operated from either side of the hoist—can't spin out of control should operator's hand slip from handle. Every hoist must withstand the shock of its capacity load dropped in increments of 1" thru 4", an impact load of well over 5 to 1. Ask your Coffing salesman for literature or write for bulletin SP, Coffing Hoist Division, Duff-Norton Co., 818 Walter Street, Danville, Ill.

COFFING HOISTS

SAVE TIME, TROUBLE

YOU CAN MAKE HOLE FASTER thanks to use of alloy steels in a wide variety of oil field equipment applications. Alloy steel tool joints, for example, provide extremely wear-resistant threads to withstand repeated make up and disassembly of joints. In addition, alloy steel is tough and resistant to impact, abrasion and corrosion—the ideal metal for drill bits, tongs, blocks, elevators, slips, draw works components and other heavy-duty equipment.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

IN SECURING CASING AND TUBING

CALL YOUR REPUBLIC DISTRIBUTOR. He handles both Republic Electric Weld and Seamless Casing and Tubing. Whether you require one type or both, he provides unexcelled service—the backbone of his business.

And, in addition to top-flight service, you secure only top-quality products through your Republic Distributor. Electric Weld Casing and Tubing are good examples. Made of flat rolled steel of carefully controlled width and thickness, they are cold formed and welded, producing pipe of maximum uniformity and concentricity. Also, since this process starts with flat steel, inside and outside surfaces can be minutely inspected before forming and welding. After fabrication, Electric Weld is normalized to produce uniform grain structure, and cold sized to provide high yield strength and perfect roundness.

All of these characteristics combine to produce exceptionally sound, strong, collapse-resistant casing and tubing—your assurance of dependability in service. Finally, Republic's electric weld process provides uniform distribution of metal in threaded ends.

Equally precise manufacturing techniques and controls protect quality of Republic Seamless Casing and Tubing—produced in the world's most modern mill by skilled craftsmen using the latest equipment.

On your next order for casing and tubing, call your Republic Oil Country Distributor. He carries Electric Weld in H-40 and J-55 grades, 2⅜" through 13⅜" O.D. and Seamless in J-55 and N-80, 2⅜" through 9⅝" O.D. Or for further information, mail the coupon today.

SPEED PLUS SAFETY are two major features of Republic Alloy Steel Spinning Chain. Heat treated to resist shock and abrasion, it provides a sure grip for fast spinning. Will elongate beyond minimum requirements, before breaking—a visible warning of excessive stress. Republic offers a complete line of oil country chain products, including boomer chain, winch line end chain, and truck and tractor tire chains.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-2107
3112 East 45th Street, Cleveland 27, Ohio

Please send me further information on:
- ☐ Casing and Tubing
- ☐ Alloy Steel
- ☐ Chain Products

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Close cooperation between the British American Oil Producing Company and GSI resulted in mapping of the Woodbine, 3,500 feet below the overhang of the Hainesville salt dome, in Wood County, Texas. British American's #1 Weisenhunt, a wildcat drilled on the location suggested by this survey, was completed on July 23 for approximately 400 bbl/d.

The Hainesville dome has been well known for years . . . but special seismic techniques, skillfully employed, brought out structural details with an accuracy that gave British American confidence to drill the overhang.

For salt dome mapping, or for any prospect that presents a difficult exploration problem, call GSI.

GEOPHYSICAL SERVICE INC.
5900 LEMMON AVENUE • DALLAS 9, TEXAS

A World of Experience in Finding a World of Oil

Has Sinclair Found Another Apache?

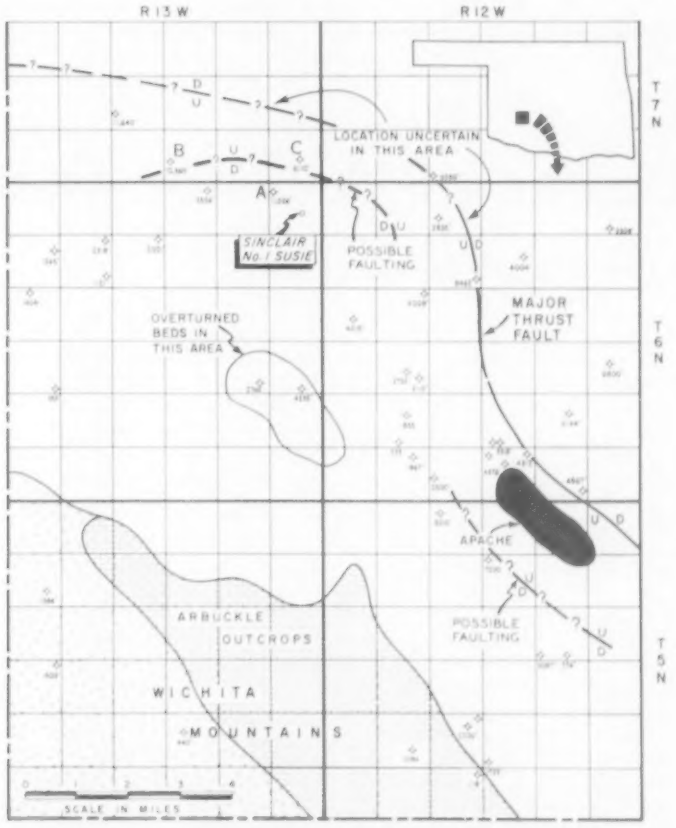
by Norman S. Morrisey

WHAT is your favorite song on the Hit Parade? Any southern Oklahoma geologist or geophysicist employed by Sinclair Oil & Gas Co., would find that an easy question to answer . . . he would choose "If You Knew Susie Like I Know Susie." The chances are at least even that he would add his own second line, "Oh, oh, oh, what a well!"

Oil men familiar with southern Oklahoma will probably agree with Sinclair, for the company's 1 Susie is cause for rejoicing. The well (NW SE 1-6n-13w) tested 50 bbl. of oil per hour on a drill-stem test of one of the Bromide sands between 8,744-91 ft. Although the well is currently drilling ahead below 9,300 ft., the operator has already cored 75 ft. of oil-stained Bromide sand in an area where these sands have produced as much as 25,000 bbl. of oil per acre.

Has Sinclair uncovered another Apache? Time and subsequent drilling will answer the question, but it certainly makes interesting speculation. Apache lies only 6 miles southeast of the 1 Susie (see map). The average field well at Apache has produced about ½ million barrels of oil and the producing depth is between 3,000 and 3,500 ft. Present data indicate that the Bromide sands in the Susie are not as well developed as those at Apache, although the initial tests have been very encouraging.

The Apache trend is a very prominent fold that can be traced for miles in the subsurface. However, attempts to find similar production in the area have proved discouraging until the Sinclair 1 Susie. Geologically, the area is a headache for the oil finder. There are probably as many structural interpretations as there are geologists and geophysicists who have studied the area.



WHAT IS THE STRUCTURAL PICTURE in the vicinity of the Susie? Here is a preliminary interpretation showing the approximate location of the regional trends.

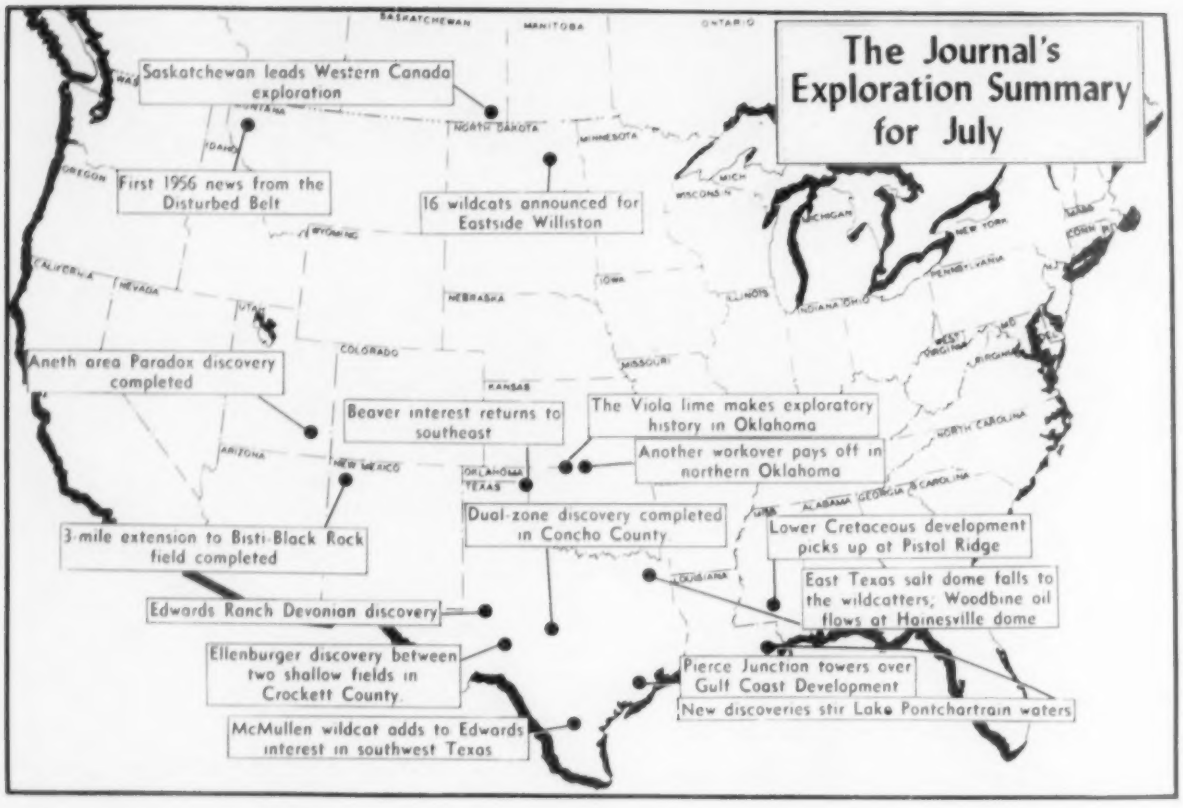
Near the outcrops . . . The Susie lies on the southwest flank of the Anadarko basin or the northeast flank of the Wichita Mountains. As a matter of fact, these mountains are exposed only 9 miles southwest of the 1 Susie (see map). But between the mountains and the Susie, some peculiar things have happened. Exactly what is anybody's guess because well control is sparse. Detailed seismic work provides only a rather broad framework on which the imaginative oil finder can hang an interpretation.

Between the Susie and the mountains, thrust faulting undoubtedly occurs. Wells less than 4 miles to the south have drilled upside-down sections, entering the Simpson beneath the Permian and bottoming in Viola. The Sinclair 1 German (well A), only 3,500 ft. northwest of the 1 Susie and in the same section, is 440 ft. lower than the discovery on the top of the Viola limestone. But 2 miles to the northwest, Shell Oil Co. plugged a dry hole (well B) that is 365 ft. higher than the discovery.

Sinclair drilled its 1 Hall (well C) 1 mile north of the Susie and abandoned it in the Mississippian before reaching the Bromide (Ordovician) sands. Scout tops indicate that the Hall may be higher than the Susie. However, the Hall encountered steep dips of 45° in the shallow beds. In the Apache area, steep dips in the pre-Permian beds normally indicate that the well is near a fault zone or on the steep flank of an overturned or thrustfaulted fold.

What controls production at the 1 Susie? How big will the producing area be? Those are two questions that will be answered by the bit. An educated guess would indicate that the structure is a complexly folded and probably thrustfaulted oil trap. One well certainly doesn't make another Apache, but you can't blame Sinclair's oil finders for singing:

"If you knew Susie like I know Susie,
Oh, oh, oh, what a well!"


The Journal's Exploration Summary for July
Saskatchewan leads Western Canada exploration
First 1956 news from the Disturbed Belt
16 wildcats announced for Eastside Williston
Aneth area Paradox discovery completed
Beaver interest returns to southeast
The Viola lime makes exploratory history in Oklahoma
Another workover pays off in northern Oklahoma
3-mile extension to Bisti-Black Rock field completed
Dual-zone discovery completed in Concho County
Lower Cretaceous development picks up at Pistol Ridge
East Texas salt dome falls to the wildcatters; Woodbine oil flows at Hainesville dome
Edwards Ranch Devonian discovery
Ellenburger discovery between two shallow fields in Crockett County
Pierce Junction towers over Gulf Coast Development
New discoveries stir Lake Pontchartrain waters
McMullen wildcat adds to Edwards interest in southwest Texas

Midsummer activity brisk, widespread as . . .

Saskatchewan Looms as Williston Giant

by John C. McCaslin
District Editor

DESPITE widespread discoveries throughout the North American Continent this year, many of which are making exploratory history, it now appears that the year's success honors will go to Southeast Saskatchewan, a looming Williston basin giant. With 100 oil wells completed, 500 anticipated, and 56 rigs running on that province's southeastern prairies, all other July developments are overshadowed.

A slow start . . . The Canadian portion of Williston was the birthplace of that basin's oil production. Manitoba's Virden area opened one of the continent's biggest yet-undeveloped petroleum provinces. Then came Beaver Lodge, Tioga, East Poplar, and a long line of others in North and South Dakota, Montana, and a few here and there in southeastern Saskatchewan.

In 1955 interest began to grow in the potentialities of southeastern Saskatchewan. At the beginning of 1956 there were bright signs of prolific success there. Now, with the year half over, exploratory and development drilling in this region tops both Canadian and United States Williston basin activity. Barring a lapse of drilling because of the steel strike, 70 rigs will be working the southeast corner of the province by winter. New fields are popping up faster than they can be named. Drilling is swift. Producing depths are relatively shallow. The weather is at its best for Canadian drilling. And there is a prolific Mission Canyon-Mississippian section waiting for the explorer. It takes about 3 weeks to drill and complete a development well in the area. Producing interval is at 4,500-5,000-ft. mark.

Outlet facilities are being expanded rapidly throughout the region, and by next year oil will be flowing freely out of the province to eager eastern markets. Leases are due to expire within the next 2 years in this section of Saskatchewan, and this will add further drilling impetus. The Mississippian boom in Saskatchewan is indeed the biggest drilling strike in Williston country since Beaver Lodge.

Regional Developments

Although the Saskatchewan boom made most of the news during July, other oil provinces figured highly in the exploratory game, particularly the Rocky Mountains, West Texas, South Louisiana, East Texas, Mississippi, and northwestern Oklahoma.

Rocky Mountains . . . Aneth and Bisti-Black Rock were once again the pacesetters for development in the mountain country.

The Texas Co. opened a new Paradox-Pennsylvanian pool 3 miles northwest of growing Aneth field in San Juan County, deep inside Utah's portion of

Total July Completions, Exploration and Development

	Total completions					Total wildcat wells					Cable tool comp.	Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage		
Alabama	9	6	0	3	89,949	2	0	0	2	10,359	1	14
Arkansas	63	35	0	28	184,061	18	5	0	13	60,130	1	68
California	240	182	8	50	1,231,896	56	10	2	44	349,260	8	200
Colorado	90	16	8	66	442,496	52	2	3	47	257,636	1	113
Florida	2	0	0	2	10,951	2	0	0	2	10,951	0	1
Georgia	1	0	0	1	2,250	1	0	0	1	2,250	0	1
Idaho	1	0	0	1	3,900	1	0	0	1	3,900	0	1
Illinois	362	162	4	196	820,170	83	4	1	78	163,311	112	561
Indiana	58	28	0	30	96,147	11	4	0	7	21,283	42	80
Kansas	415	191	32	192	1,314,848	82	11	6	65	316,057	112	405
Kentucky	157	66	10	81	235,589	30	1	0	29	42,092	143	231
West	143	66	0	77	190,545	30	1	0	29	42,092	129	203
East	14	0	10	4	45,044	0	0	0	0	0	14	28
Louisiana	309	144	43	122	2,309,811	71	13	10	48	668,225	0	470
North	130	70	11	49	455,111	24	2	1	21	125,678	0	164
South	137	53	27	57	1,453,483	35	9	5	21	409,615	0	232
Offshore	42	21	5	16	401,217	12	2	4	6	132,932	0	74
Michigan	41	16	0	25	116,194	20	0	0	20	54,597	32	112
Mississippi	46	12	0	34	313,355	29	3	0	26	195,462	1	31
Montana	39	21	0	18	185,267	15	2	0	13	68,282	5	96
Nebraska	62	25	0	37	345,259	28	3	0	25	145,353	3	61
West	56	25	0	31	325,357	22	3	0	19	125,451	0	51
East	6	0	0	6	19,902	6	0	0	6	19,902	3	10
New Mexico	181	86	63	32	761,776	24	5	0	19	117,557	21	253
Northwest	77	5	60	12	273,172	7	1	0	6	26,194	0	109
Southeast	104	81	3	20	488,604	17	4	0	13	91,363	21	144
New York	97	40	2	55	125,068	7	0	1	6	22,668	97	43
North Dakota	21	10	0	11	145,560	9	0	0	9	46,135	0	22
Ohio	70	42	11	17	160,447	1	0	0	1	3,961	68	168
Oklahoma	632	369	28	235	2,223,867	58	11	1	46	257,468	104	989
Oregon	1	0	0	1	2,000	1	0	0	1	2,000	0	1
Pennsylvania	21	0	15	6	100,992	1	0	0	1	5,265	20	96
South Dakota	2	0	0	2	17,254	2	0	0	2	17,254	0	3
Tennessee	2	0	0	2	4,682	2	0	0	2	4,682	2	0
Texas	1,900	1,185	76	639	8,154,132	460	67	15	378	2,352,624	67	1,155
North (9)	416	206	5	205	1,109,901	98	14	1	83	337,283	10	112
West Central (7-B)	256	142	0	114	862,058	93	13	0	80	350,793	25	157
West (7-C & 8)	521	470	0	51	2,615,009	62	15	0	47	402,988	24	432
Panhandle (10)	125	94	15	16	510,938	16	2	5	9	126,443	0	81
East (5 & 6)	76	37	4	35	389,376	27	2	0	25	123,960	3	101
Southwest (1)	133	81	2	50	335,134	33	1	1	31	105,776	1	44
Gulf (2)	59	20	14	25	397,983	24	3	2	19	161,317	0	34
Gulf (3)	162	83	11	68	1,129,013	48	7	2	39	413,337	0	125
Southwest (4)	152	52	25	75	804,720	59	10	4	45	330,687	4	69
Utah	8	4	1	3	49,177	2	1	0	1	13,172	0	33
West Virginia	57	7	43	7	142,220	2	0	1	1	2,216	57	229
Wyoming	83	33	8	42	350,012	21	1	1	19	87,590	4	174
Total July 1956	4,970	2,680	352	*1,938	19,939,330	1,091	†143	41	907	5,301,740	901	5,611
Total June 1956	4,837	2,574	327	1,936	19,113,997	1,084	131	37	916	4,981,177	941	5,567
Cumulative 1956	33,808	18,555	2,263	12,990	137,266,365	7,392	986	246	6,160	35,478,751	5,337	
Cumulative 1955	32,367	18,404	1,960	12,003	129,078,318	6,925	1,063	211	5,651	33,366,040		
Western Canada	368	272	29	67	1,786,152	80	22	6	52	456,705		
Alberta	219	161	22	36	1,202,765	43	11	5	27	289,458		
Saskatchewan	120	95	1	24	499,968	30	11	0	19	147,372		
Manitoba	22	16	0	6	48,632	5	0	0	5	12,016		
British Columbia	7	0	6	1	34,787	2	0	1	1	7,859		
Cumulative 1956	1,658	1,225	83	350	8,122,997	384	75	32	277	2,015,430		

*Incl. 80 service wells: Kans. 4, S. La. 3, N. Y. 23, Okla. 36, La. 6, N. Tex. 8. †Incl. 25 cond. wells: S. La. 2, Miss. 1, Okla. 4, N. Tex. 2, Tex. Panhandle 2, E. Tex. 1, Tex. Gulf (3) 11, S.W. Tex. (4) 2. ‡Incl. 5 cond. disc.: S. La. 1, Tex. Panhandle 2, Gulf (3) 2.

the Paradox basin. The 2 Navajo-G, C SE SE 18-40s-24e, flowed 436 bbl. of oil per day on 1-in. choke from perforations at 5,497-5,537 ft. The offset well is under way in 19-40s-24e.

At month's end Carter Oil Co. announced plans for a deep test 17 miles west of Aneth field near the town of Bluff. The 2 Navajo-Gothic, C SE NE 36-40s-21e, San Juan County, will go to the Paradox at about 6,000 ft. There has been no deep drilling in this area, and there is no production. Rocky Mountain drillers will be watching this one closely.

. . . Bisti-Black Rock. This coming colossus of the San Juan basin added a significant 3-mile extension discovery in July. British-American Oil Producing Co. completed the 1-B Salge in C NW NW 34-26n-13w, San Juan County, New Mexico, for 880 bbl. of oil per day on ¾-in. choke from Gallup sand, topped at 4,888 ft. This discovery moves the field 3 miles northwest.

Nearer the center of production Amerada Petroleum Corp. finaled the 2 Nah-Des Pah for 1,368 bbl. of oil daily on ¾-in. choke; the company also completed the 2 Joan White for 1,268 bbl. of oil per day on ¾-in. choke.

The success at Bisti-Black Rock set off a flurry of wildcats in the general

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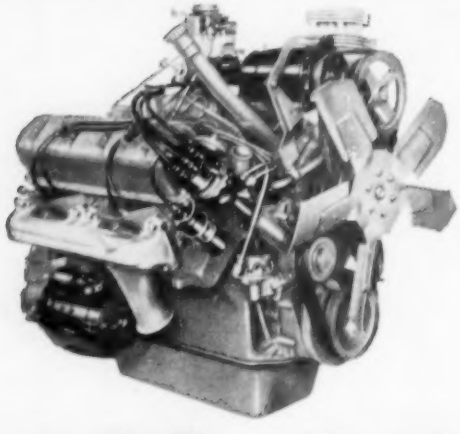

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area. The prolific production being found in this Upper Cretaceous sand has changed the entire oil perspective of the San Juan basin. The basin has risen to oil heights only in recent months. Until this year, gas exploration has been the drilling theme. Bisti-Black Rock has changed all this.

. . . **Disturbed belt.** Gulf Oil Corp. may have revived lagging hopes for Montana's disturbed belt as a result of shows in the Upper Mississippian at the 1 Teton-Knowlton in Teton County.

The well recovered 3,550 ft. of gas and 350 ft. of heavily gas-cut mud on drill-stem test at 5,500-60 ft. in the Sun River dolomite. Location is in remote wildcat country. Exploration men hope for success at this venture. Commercial oil in this region would offset the disappointment following the Morning Gun failure last year in Glacier County.

West Texas . . . Pennsylvanian, Ellenburger, and Devonian discoveries stirred West Texas exploration in July. The most significant was a dual Pennsylvanian strike in Concho County on the far eastern platform of the Permian basin. Ray Smith Drilling Co. and Tucker Drilling Co. 1 Henderson made an estimated 12,000 M.c.f. of gas per day on test of the Strawn lime and flowed 22 bbl. of oil per hour from the Canyon sand.

East Texas . . . Two of East Texas' salt domes were opened to production, heralding the most significant exploratory event in this province since East Texas field itself. British-American Oil Producing Co. completed its news-making Woodbine discovery on the Hainesville dome, in Wood County, while The Texas Co. opened a small Woodbine producing area on Anderson County's Bethel dome.

Southwest Texas . . . Standard Oil Co. of Texas 1 Henry, a rank McMullen County wildcat, 8 miles northwest of Tilden, blew out while preparing to test the deep Edwards lime. Success here will further strengthen the growing chain of deep Edwards fields being opened on the southwest extension of the Balcones fault zone.

Lake Ponchartrain . . . This shallow lake near New Orleans held the drilling interest for South Louisiana in July. Humble Oil & Refining Co. opened a new oil field in the southwestern part of the lake, just offshore from Jefferson Parish, 10 miles northwest of New Orleans. This is the second field to be opened in this section of the lake, only recently opened to exploration. The Humble discovery follows one made by Shell Oil Co., 5 miles west in St. Charles

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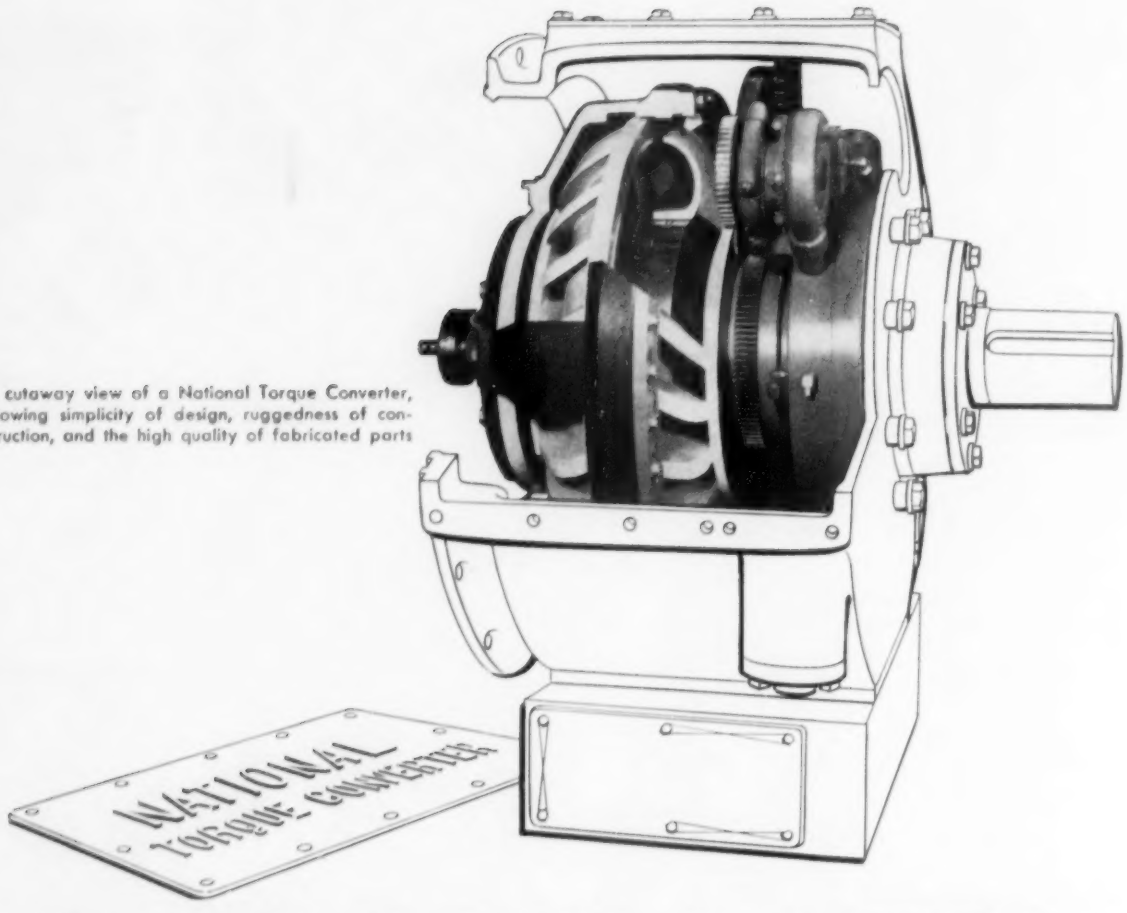

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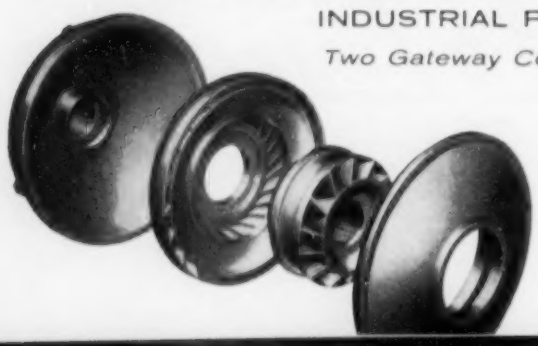

Pace-setters in the progress of industrial power transmission

Total Depth Classifications, July 1956

	0-1,250 ft.	1,250-2,500 ft.	2,500-3,750 ft.	3,750-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	12,500-15,000 ft.	Over 15,000 ft.
Alabama	0	0	0	1	1	2	5	0	0
Arkansas	4	25	16	14	3	1	0	0	0
California	18	43	44	40	34	36	15	9	1
Colorado	5	5	6	15	57	2	0	0	0
Florida	0	0	0	1	1	0	0	0	0
Georgia	0	1	0	0	0	0	0	0	0
Idaho	0	0	0	1	0	0	0	0	0
Illinois	41	165	156	0	0	0	0	0	0
Indiana	21	30	7	0	0	0	0	0	0
Kansas	44	56	190	110	15	0	0	0	0
Kentucky	82	51	24	0	0	0	0	0	0
West	81	51	11	0	0	0	0	0	0
East	1	0	13	0	0	0	0	0	0
Louisiana	8	60	33	12	21	71	62	32	10
North	7	58	31	9	7	16	2	0	0
South	1	1	1	3	11	37	46	27	10
Offshore	0	1	1	0	3	18	14	5	0
Michigan	2	14	16	8	1	0	0	0	0
Mississippi	0	0	0	6	29	8	3	0	0
Montana	0	9	8	7	9	6	3	0	0
Nebraska	0	2	3	12	45	0	0	0	0
West	0	0	1	10	45	0	0	0	0
East	0	2	2	2	0	0	0	0	0
New Mexico	3	41	44	55	23	1	10	3	1
Northwest	1	31	18	8	19	0	0	0	0
Southeast	2	10	26	47	4	1	10	3	1
New York	0	90	7	0	0	0	0	0	0
North Dakota	0	0	4	5	1	11	0	0	0
Ohio	9	5	51	5	0	0	0	0	0
Oklahoma	79	158	193	72	82	37	5	6	0
Oregon	0	1	0	0	0	0	0	0	0
Pennsylvania	0	0	12	0	8	1	0	0	0
South Dakota	0	0	0	0	0	2	0	0	0
Tennessee	0	1	1	0	0	0	0	0	0
Texas	189	451	357	316	324	185	58	20	0
North	72	185	44	64	48	3	0	0	0
West Central	40	80	38	47	50	1	0	0	0
West	6	118	113	123	80	45	19	17	0
Panhandle	0	8	89	6	6	13	3	0	0
East	4	10	7	14	27	12	2	0	0
Southwest (1)	47	28	28	15	12	1	2	0	0
Gulf (2)	2	0	2	12	18	22	3	0	0
Gulf (3)	10	6	11	16	35	60	21	3	0
Southwest (4)	8	16	25	19	48	28	8	0	0
Utah	0	0	0	0	7	1	0	0	0
West Virginia	2	32	18	5	0	0	0	0	0
Wyoming	12	14	18	8	23	6	1	1	0
Total July 1956	519	1,254	1,208	693	684	370	159	71	12
Total June 1956	433	1,167	1,228	781	718	294	145	60	11
Cum. 1956	3,136	8,005	8,262	5,294	5,051	2,501	1,025	461	73
Western Canada	4	40	49	122	120	22	7	4	0
Alberta	3	14	18	42	111	21	6	4	0
Saskatchewan	1	5	30	75	7	1	1	0	0
Manitoba	0	21	0	1	0	0	0	0	0
British Columbia	0	0	1	4	2	0	0	0	0
Cum. 1956	13	152	206	498	656	112	15	6	0

Parish. Shell got gas condensate from two wells, and is now on the third test. These two new discovery areas in the lake have set off hopes for drilling in the shallow waters on a larger scale. Southern Natural Gas Co. will drill a 10,000-ft. test on the northeast side of the lake at Big Pointe, the only previous producing area in the lake.

Mid-Continent . . . Northwest Oklahoma continued to keep exploratory interest high in the Hugoton and Mid-Continent region.

A new gas-distillate reservoir was opened in the Cherokee area of Alfalfa County by Calvert Drilling Co. The 1 Newlin is near the Oakdale multipay field, one of the exploratory highlights of 1955. Calvert's well, a Bartlesville sand strike, will increase drilling interest on the Harper-Woods-Alfalfa trend in northwestern Oklahoma.

The southeastern portion of Beaver County in the Oklahoma Panhandle returned to the exploration fold in July with success at a Douglas-Pennsylvanian wildcat, White Eagle-Shell 1 Baldwin. The well flowed 1,450 M.c.f. of gas per day. This success is expected to further increase development of this wildcat country.

A remote Viola lime discovery in eastern Harper County at month's end opened first Viola production in the entire western Anadarko basin region. Offset attempts here will be watched closely by Hugoton embayment operators.

U. S. Williston . . . The industry eagerly awaits the outcome of 16 wildcat tests on the eastern rim of the Williston basin in North Dakota. Calvert Drilling Co. will drill wildcats in scattered counties along the eastern side of the basin from Eddy, Foster, Wells counties on the north to Logan and McIntosh counties on the south. Drilling is under way at two of these wildcats. The tests will go to the Mission Canyon in most cases, and to the granite in others.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

NORTH TEXAS

Young County Wildcat Completes as Pumper

Taubert & Steed 1 J. W. Cox, wildcat just east of Markley townsite in Young County, has been completed as a 100-bbl. a day pumper. The discovery found pay at 3,535 ft. and drilled to 3,549 ft. Gravity of the oil was 40°, with gas-oil ratio at 375:1. Location is in Block 13, Young CSL Survey. Offset acreage is held by Gilmore and Fresno on the north, and C. B. Christie on the east.

Canyon Sand Discovery Finaled in Nolan County

Sun Oil Co. 1-A Parramore, 83-1A-H&TC Survey, located 8½ miles southwest of Maryneal, has been completed as a flowing discovery. Potential through 11/64-in. choke was 146 bbl.

Exploration this week

Mid-Continent	163
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of 46° oil a day, from perforations at 5,718-34 ft. Gas-oil ratio was 1845:1, with pressure on tubing at 90 psi.

OKLAHOMA

West Stealy Field Moves to South

West Stealey field in McClain County, south-central Oklahoma, has been extended one location south at Magnolia Petroleum Co. 4 Love, C SW NW 9-5n-2w. The well made a natural flow of 500 bbl. of oil per day on 12/64-in. choke from the Bromide sand at 8,232 to 8,380 ft.

Southeast Laffoon Field Extended

The Dutcher sand reservoir in Okfuskee County's Southeast Laffoon District was extended by Amerada Petroleum Corp.'s 1 Case, NW SW NE 20-13n-7e.

The well flowed 15 bbl. of oil per hour on a drill-stem test at 3,692-3,720 ft. This wildcat is about 1 mile north of the drilling program now in progress in the Dutcher sand. Location is the southwest corner of the township.

High Flow Reported At Oakdale Field Well

Amerada Petroleum Corp. 1 Copenhaver, SW NE 21-24n-13w, Oakdale field well in Woods County, northwestern Oklahoma, flowed 179 bbl. of oil in 24 hours and 350 M.c.f. of gas per day on a drill-stem test of the Simpson sand at 7,447-54 ft.

Shallow Oil Strike Finaled in Lincoln

Lincoln County in central Oklahoma has a new shallow Cleveland sand oil reservoir as a result of the successful completion of Nadel & Gussman's 2 Teters, NE SW SW 14-16n-6e.

The well flowed 205 bbl. of oil in 20 hours on ¾-in. choke, natural, from perforations at 2,180-90 ft.

Humphrey Has Springer Hit On Knox-Chitwood Axis

The 1 Burrus-Pyle, a Humphrey Oil Corp. wildcat on the Knox-Chitwood line of folding in SW SE 23-4n-6w, Grady County, is a possible Springer sand gas discovery.

The well flowed 11,000 M.c.f. of gas per day and a heavy oil spray on test of the lower Springer sand entered at 10,580 ft. The well was a Boatwright sand test to 12,500 ft. Plans called for hitting the Ordovician sands at about 15,000 ft.

Garvin Rework Flows Bromide Sand Oil

An-Son Petroleum Corp. 1-A Ledgerwood, SW NW NW 17-4n-2w, flowed 100 bbl. of oil in 10 hours on various size chokes from perforations in the Viola lime at 7,154-86 ft., following acidization. This rework well is near Superior Oil Co.'s 2-18 McCroskey in C NW NE 18-4n-2w, which flowed 57 bbl. in 19 hours on ⅛-in. choke from the Bromide sand at 7,292-98 ft.

WESTERN KANSAS

Casing Set At First Wallace County Strike

Skelly Oil Co. set casing at the first producer in Wallace County, the 1 Sexson, NW NE SW 19-13s-42w, 65 miles northwest of Hugoton gas field and 15 miles west of Sharon Springs, Kansas.

Otis...
"First in Pressure Control"

The Morrow discovery gaged 5,210 M.c.f. of gas on a drill-stem test at 4,994-5,015 ft. Another test at 4,994-5,040 ft. got 5,200 M.c.f. per day.

This well is the most remote discovery in Kansas in several years. Location is near the flanks of the Las Animas arch in real wildcat country. Success at this well will be an important step toward further development in this undeveloped section of the Mid-Continent province.

KANSAS

Sheridan Wildcat Is Lansing Prospect

Lansing oil was recovered on drill-stem test at 3,806-37 ft. at Heathman-Seeligson Drilling Co. 1 Decker "A," NW NW NW 6-9s-28w, 4 miles southwest of Hoxie and 10 miles west of new Advance pool.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Casing Run At New Beaver County Strike

Cabot Carbon Corp. ran casing at a new Hoover-Pennsylvanian sand discovery in the extreme eastern part of Beaver County. The 1 Barby-E, SE NW SE 31-4n-28eCM, flowed 1,500 M.c.f. of gas per day on a drill-stem test at 4,302-30 ft.

Boyd field . . . Sun Oil Co. has a new oil well in Southeast Boyd field, Beaver County.

The 1 Bartel, C SW NE 16-2n-21eCM, flowed 2 bbl. of oil per hour on test at 7,122-31 ft. This field has both Morrow oil and gas production.

New pool . . . White Eagle Oil Co. and Ohio Oil Co. opened a new pool in Beaver County at their 1 Barby, C NE SW 24-3n-25eCM, 6 miles east of Camp Creek field and 3 miles south of Ridgeway field.

The discovery well flowed 2,635 M.c.f. of gas per day on a test of the Tonkawa-Pennsylvanian sand at 5,490-5,509 ft.

Big Keyes Area Gas Well Completed

Colorado Interstate Gas Co. finaled the 1 Bryan in SW SW NE 31-5n-8eCM, Cimarron County, far northwestern Oklahoma, for 35,000 M.c.f. of gas per day on open flow test.

Perforations were in the Keyes-Penn sand at 4,824-30 and 4,835-40 ft.

EASTERN INTERIOR

ILLINOIS

Cooks Mills Adds Eight More Wells

Eight more producers were added to Cooks Mills Consolidated field, including four in the Arcola area, two near Bourbon, and two at Cooks Mills. There were three dry holes during the same period.

Most of the work was centered in the Bourbon area, but five rigs were in operation southwest of Arcola, two tests near Chesterville, three rigs drilling at Bourbon, one northwest of Arthur, one northeast of Garrett, and three working in Cooks Mills.

Southwest of Arcola John Wheeler's well on the J. W. Skinner farm in SE SW 18-14-7, got 8 ft. of good saturation and 4 ft. of scattered shows in the Rosiclare. Jack Hirsch et al in NW SW 18-14-8 got 5 ft. of good saturation on first cores. E. E. Spencer Drilling Co. uncovered about 15 ft. of saturation on the fifth well to be put down on Fred Schageman farm, SE SW 17-14-8. The fourth well on this lease flowed 30 bbl. of oil per hour, natural.

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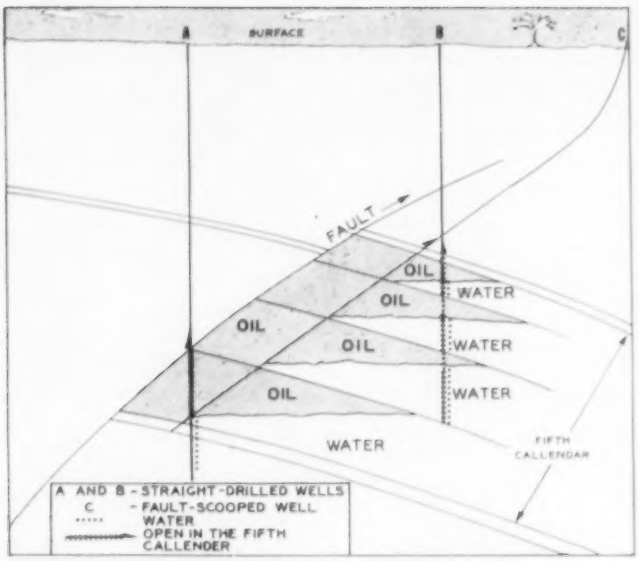
OTIS PRESSURE CONTROL, INC.

Branches Throughout the Oil Country

New Slant-Hole Drilling Method Drains Fault Zones

by William T. Smith
District Editor



Fault scooping means that wells are slant drilled just under and parallel to the fault, thus taking in the maximum amount of pay zone.

UNION OIL CO. OF CALIFORNIA has developed a drilling technique in old Dominguez field south of Los Angeles which has resulted in 200-bbl. per day completions in a zone which previously boasted of a best of 20 bbl. daily.

Until a better name comes along, Union has labeled the method "fault scooping."

Boiled down, fault scooping merely means that wells are slant drilled just under and parallel to the fault thus taking in the maximum amount of producing zone. However, the simple explanation doesn't do justice to the precise engineering required.

Union officials readily concede that the discovery of this technique resulted largely from some Monday morning quarterbacking. Engineers examined the record of a well which was originally expected to be a 25-50-bbl. well but which turned out to be a 200-bbl. well. Also, this particular well, in an attempt to salvage some costs on the dry-hole effort, was a redrilled dry hole.

It all started like this.

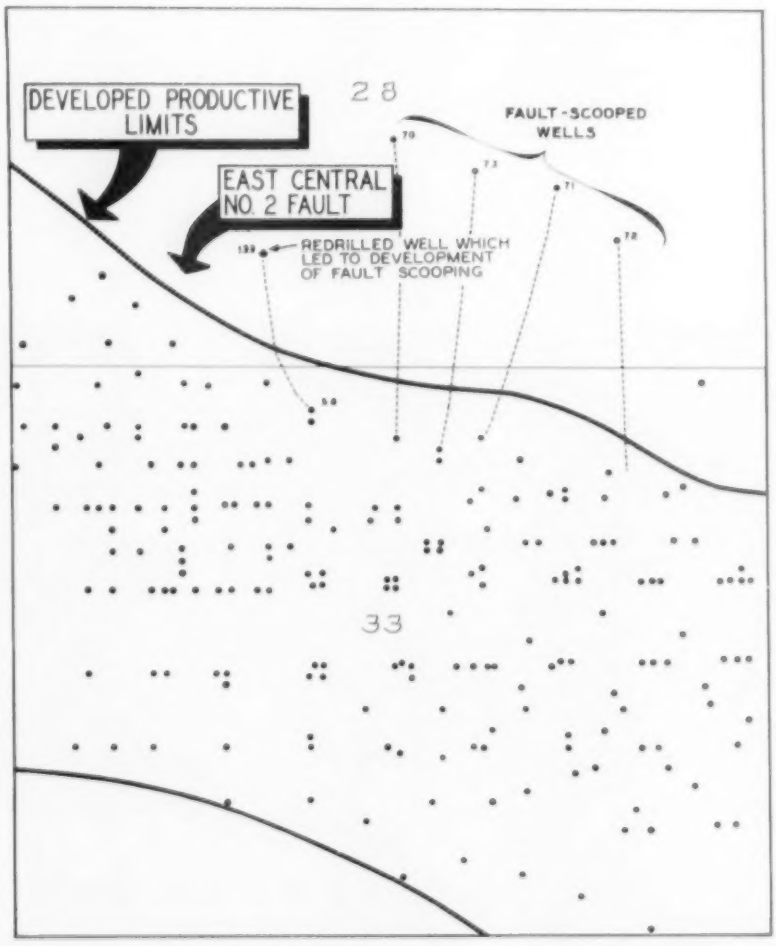
Union drilled 58 Callender in 1943 as a fifth Callender zone completion at 5,510-6,098 ft. for 20 bbl. daily. While 58 Callender, and several other fifth zone completions, is still on production, it has never made more than 20 bbl. daily and currently is pumping 8 bbl. daily which is almost submarginal for the field.

Examination of the structural map of the zone led Union engineers to believe that 58 Callender was bottomed too close to the regional fault and sands had been subject to crushing which in turn cut down permeabilities.

At this point enter another well.

This was 133 Callender which was originally drilled to tap the seventh and eighth Callender zones of the field. It was drilled about 1,200 ft. north of 58 Callender and total depthed at 7,818 ft. It was a dry hole.

Union engineers decided that for very little extra cost, they could use 133



Union Oil Co. of California has developed a drilling technique in old Dominguez field, south of Los Angeles, which has resulted in 200-bbl. wells from wells that produced only 20 bbl. previously.

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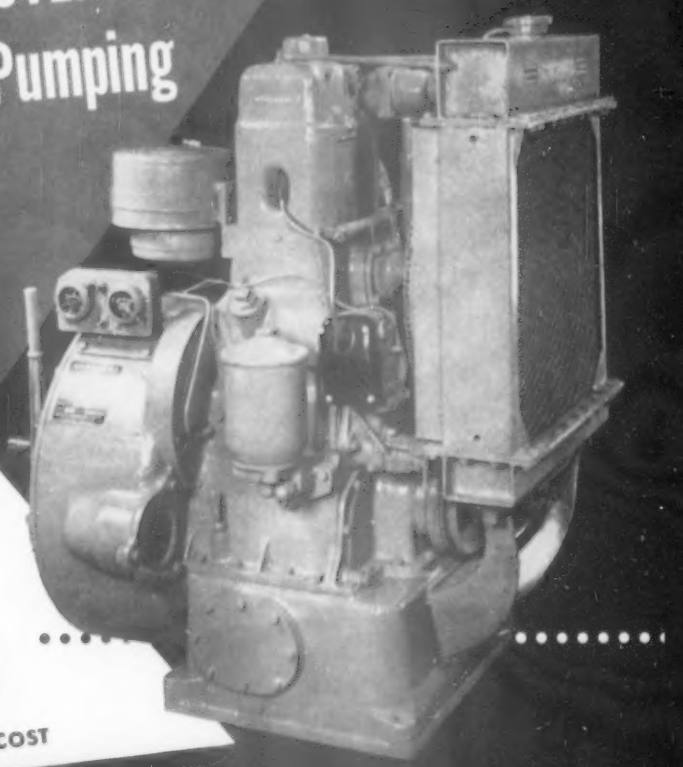

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Callender's location and casing and slant drill it to bottom a little farther down structure than 58 Callender for a 25-50-bbl. completion in the fifth Callender zone. A whipstock was set at 4,000 ft. in 133 Callender which was redrilled south toward 58 Callender's bottom-hole location. At 5,500 ft. it went under the East Central No. 2 fault with the hole at a 32° angle. In so doing, it opened up several hundred additional feet of the fifth zone.

Union didn't anticipate the eventual completion production rate and installed a pump without capacity to equal the volume of production available. As soon as the production figures were noted, 211 bbl. daily, company engineers studied the drilling record and concluded that the slant-drilled well had in effect scooped out considerably more of the fifth zone than the straight drilled 58 Callender.

First engineered well . . . The first engineered fault-scooped well was 70 Hellman. For this, Union moved an additional 1,200 ft. northeast of 133 Callender for a drill site. Slant drilled, the drift angle was increased at the rate of 2½° per 100 ft. until a 60° deviation was reached. It was bottomed 2,180 ft. from the surface location at a vertical depth of 5,800 ft.

It cut 1,200 ft. of fifth Callender zone. It was put on the pump for 344 bbl. gross, 182 net of 28.6°-gravity crude daily and 125 M.c.f. of gas daily. In drilling this first planned fault-scooped well, it went by a straight-drilled fifth Callender zone well making only 11 bbl. daily.

The next two fault-scooped wells were equally as successful. On one, 71 Hellman, the water cut was 80 per cent but the net was still 175 bbl. daily. Union determined that it was more economical to produce the water in wells with cuts ranging as high as 80 per cent than it would be to attempt water shutoffs in the highly interbedded thin sands and shales of the Pliocene zone.

Technique improved . . . The latest fault-scooped well, 73 Hellman, was completed on the pump for 679 bbl. gross, 446 bbl. net of 27.4°-gravity crude and 721 M.c.f. of gas daily from 1,050 ft. of fifth zone open between 5,839-6,889 ft. The first day after completion it started to flow so it was taken off the pump and has flowed a steady 450 bbl. daily, cutting only 29 per cent, since May 1956.

The fact that it is flowing and has a much smaller cut than other fault-scooped wells in the fifth zone is attributed to a successful water shutoff within the producing interval. This was accomplished by use of a blank section

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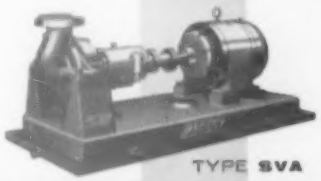

TYPE SVA

RATINGS	TYPE SVA	TYPE SVS	TYPE SVC	TYPE RVC
Capacity – in GPM	15 to 1300	15 to 1000	25 to 3200	50 to 600
Pressure – in PSIG	To 600	To 600	To 600	To 600
Head – in feet	To 600	To 600	To 600	To 900
Temperature – °F	To 300	To 300	To 850	To 850
Number of stages	One	One	One	Two

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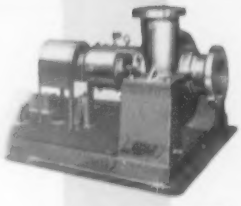

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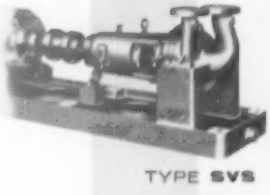
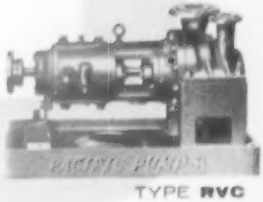


TYPE SVS



TYPE RVC

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opposite the wet interval at 5,976-6,048 ft.

Drilling . . . Union's drilling practice in these fault-scooped wells is to set 11¾-in. casing to 1,000 ft. and drill ahead with 9⅞-in. bits to total depth using a fresh-water oil-emulsion mud. For completion a 7-in. combination string is run to bottom. Drilling time from spud to completion averages 27 days.

In the case of 73 Hellman, the whipstock was set at 3,520 ft. with an angle buildup rate of 2½° per 100 ft. until a maximum angle of 64° was reached and the hole then held at that angle.

This fault-scooping technique is best adaptable to fields where flat-dipping fault conditions exist. It enables the operator to get oil not capable of being drained in any other fashion by going up under the fault and getting more of the zone than in a straight-drilled well.

PACIFIC COAST

CALIFORNIA

Bandini Extends Devils Den Find

Bandini Petroleum Corp's first extension test of its new fault block discovery at Devils Den field, Kern County, was completed for 324 bbl. daily of 43.3°-gravity crude through a 16/64-in. choke. This well, 4 U. of C., has 143 ft. of zone open between 3,494-3,790 ft. Total depth is 3,829 ft.

This first offset is located 240 ft. south of the discovery well, 3 U. of C., which was good for 153 bbl. daily when completed last month. Bandini expects to start its third well in the play before the end of August. The other company involved in the new fault block discovery action is General Petroleum Corp. G.P. was nearing completion of an extension test about 700 ft. north of the discovery in SE NW 3-25s-18e.

Albercalif Nears Find In Orange County

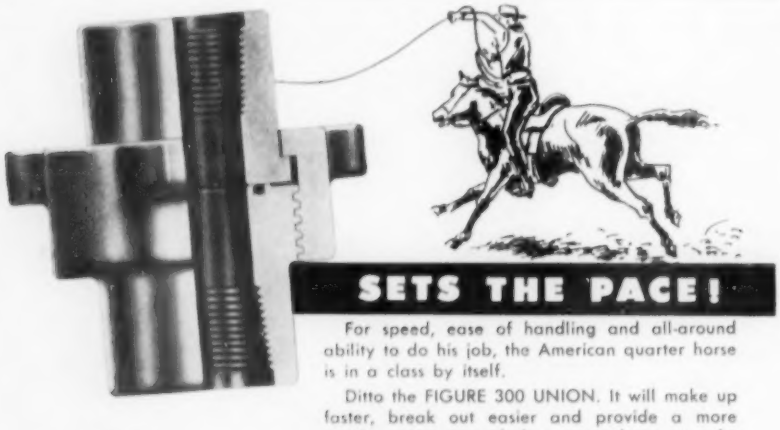
Albercalif Petroleum Corp., Ltd., was nearing a possible new fault block discovery in the center of the Carlton Tract on the west fringe of Yorba Linda field, Orange County. The wildcat, 1 Columbus-Rexall, reported 170 ft. of zone open between 2,562-98 ft. The operator landed 7-in. casing, including perforations in the open zone, to 2,598 ft. in the 2,600 ft. deep hole. After water shutoff and production tests, the operator may gun perforate an upper section at 2,430-2,546 ft. This wildcat is in SW SW 16-3s-9w, ¾ mile from the nearest Yorba Linda field producer and 1 mile east of East Coyote field production.

Superior Scores at Honor Rancho

Superior Oil Co. has completed an extension test in the new southeast area of Honor Rancho field, Los Angeles County. This area was discovered last May by The Texas Co. Superior's well, 5 N.L.&F., located 735 ft. south of the area discovery, was completed flowing 1,073 bbl. daily of 36.7°-gravity crude through a 17/64-in. choke. The operator landed 350 ft. of 5½-in., including 326 ft. of perforations, to 9,188 ft. Also, 2⅞-in. tubing with packer was hung at 9,172 ft. Total depth of the test is 9,189 ft. This well is in NW NE 8-4n-16w.

Gas Discovery

Beach, Church and Bell, operators, scored a new gas field discovery on the south flank of Blackwells Corner oil field in Kern County. The operators completed 1 Scherrer flowing gas at an estimated rate of more than 3,000 M.c.f. daily from the interval 3,344-49 ft. Nearest oil production is more than 1½ miles north at Blackwells Corner.



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ARK-LA-TEX

EAST TEXAS

Hainesville Salt Dome Area Draws Additional Tests

Successful completion of a well on the Hainesville salt dome in Wood County by British-American Oil Producing Co. has brought on two additional tests for the area. One of these is also by British-American and will be a west stepout to their Woodbine discovery. The other will be drilled by Trice Production Co. and F. R. Jackson, both with headquarters in Longview.

The B-A test will be 1 Victoria Warlick, in the Tollett Survey, west of the 1 Wisenhunt. At this writing, projected depth at 1 Warlick was only 5,500 ft.

Trice Production and F. R. Jackson have made location for a 10,000-ft. wildcat as the 1-A A. C. Wood estate, located on a 153-acre tract in Peter Tidwell Survey, A-581. This location is 3 miles north of British-American 1 Wisenhunt, which had Woodbine oil around 9,200 ft., and approximately 1 mile south of Trice 1 Dohr, in the A. Yarbrough Survey, which was recently completed dry at 10,500 ft. No

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information was released on the latter wildcat.

British-American's successful test is the most northern salt dome producer in the East Texas district, being over 60 miles northeast of salt dome production in Bethel and Boggy Creek fields. No. 1 Wisenhunt went into the salt overhang at 1,795 ft., came out at 5,690 ft., and found oil in the Woodbine at 9,215 ft.

Southern Wood County gained a deep test 2½ miles northwest of Crow. It will be Southland Co., Dallas, 1 J. C. Judge. Projected depth is 8,500 ft., to test the Woodbine, and location is in the H. Dickson Survey, A-151.

Second Test Set for Bethel Salt Dome

The Texas Co. has announced location for a confirmation well offsetting its recent discovery on the Bethel salt dome in Anderson County.

The second well will be 2 E. C. Williams, located in Juan N. Acosta Survey, A-1, which is a southwest offset to the discovery. Projected depth is 6,900 ft.

Texaco's recent Woodbine discovery there was disappointing in the amount of oil it produced, making 10 bbl. of oil and 19 bbl. of water a day, but it did open production on the dome after several unsuccessful attempts. No. 2 E. C. Williams, the discovery, indicated good production on early drill-stem tests. It went into the salt at 1,654 ft. and came out at 4,500 ft. Recovery on test in the Woodbine around 5,600 ft. was 1,000 ft. of oil.

ARKANSAS

Gas Slated For Conway County Site

Arkansas Louisiana Gas Co. will drill a wildcat gas test in Conway County, about 11 miles north of Morrilton. The 1 J. E. Merryman, 16 miles east of Moreland gas field and 6 miles southeast of Carter Oil Co.'s recent Jerusalem field gas discovery, will go to about 3,600 ft. It will be drilled with cable tools.

The new well is a part of the company's expanded 1956 search for new gas reserves which contemplates drilling 25-30 wells this year. Most of the exploratory work will be done in rank wildcat areas of Arkansas.

Cecil field . . . Development of gas production in Franklin County's Cecil field area is being continued by Arkansas Louisiana Gas Co. Two cable tool rigs are operating in this field, continuously since 1948. There are 16 producing gas wells in the field. Production is from multipay gas sands from 2,000-5,000 ft. in depth.

APPALACHIAN

OHIO

One of the best wells yet found in the large Flint Ridge field was completed by Clinton Oil Co. on 3 John Spencer, Lot 3, Hopewell Township, Licking County. A good oil showing in Clinton sand at 2,995-3,032 ft. gaged 650 bbl. in a 24-hour test after fracture.

● Scott Oil Co. has reported volume of their two gassers in Howard Township, Knox County. The 1 James Cornelius, Lot 1, logged Clinton at 2,715-2,762 ft. with 500,000 cu. ft. natural and an estimated 5,000,000 cu. ft. after fracture. The 1 J. R. Weber, Lot 2, logged the Clinton at 2,750-2,802 ft. with the same natural and after fracture volume. Rock pressure is 1,075 lb.

● A second producer in the area between Logan and Ewing was completed by W. C. Adair on 1 J. F. Harsh, Section 35, Falls Township,

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Hocking County. Clinton came in at 2,831-60 ft. and gaged 110 bbl. in 24 hours after fracture.

WEST VIRGINIA

In Falling Springs district, Greenbrier County, West Virginia, Columbian Carbon Co. is moving in at 1-1247 Cherry River Boom & Lumber Co., rank wildcat, elevation 2,884 ft., Lobelia Quadrangle, 1.20 miles south of latitude 38° 15 minutes and 1.09 miles south of longitude 80° 25 minutes.

- Dry Fork district, Randolph County, Hope Natural Gas Co. 9986 West Virginia Evergreen Co., elevation 3,023 ft., topped the Oriskany sand at 4,847 ft. Gas testing 1,356,000 cu. ft., was recorded in this formation. Drilling is at 5,028 ft.

- Magnolia district, Mingo County, Carnegie Natural Gas Co. completed two large volume gas wells in the Big lime formation on property of United States Steel Corp. They are No. 7-1692 gaging 20,000,000 cu. ft., TD 2,842 ft., and No. 9-1694 gaging 25,000,000 cu. ft., TD 2,896 ft.

PENNSYLVANIA

Young Township, Indiana County, Southwest Pennsylvania, Manufacturers Light & Heat Co. 4336 G. L. Stewart and R. & P. Coal Co., wildcat, reached the Oriskany sand at 7,467 ft., had a show of gas at this depth gaging 52,000 cu. ft., and shut down at 7,468 ft.

- In Armstrong Township, Columbian Carbon Co. 1833 Susie Yosurack is drilling at 4,272 ft.

GREAT LAKES

MICHIGAN

Salina Gas Pay Logged at Allegan Wildcat

A Salina dolomite gas pay, estimated at 1,000,000 cu. ft. a day, but ungaged, was logged at D. B. K. Van Raalte & McClure Oil Co. 1 Koopman, NE NE SW 16-4n-14w, Overisel Township wildcat, Allegan County—first deeper zone test well in the Overisel Traverse oil pool. Gas showed from pay logged at 2,650-68 and 2,665-69 ft. in 5-in. hole. This gas was strong enough to clean hole of water and to blow out 5-in. casing seat at 2,042 ft. No additional tests had been run.

- A basal Salina-Niagaran gas and oil pay was logged in Dorr field, Allegan County, at Louis Zellman 1 Helmer, SE NW NE 25-4n-13w, Salem Township. This deeper pay, logged at 2,925 ft., showed a good head of gas and some free oil through a hole full of water and before a 4-in. liner was run and cemented at 2,925 ft. This particular pay is not new in this pool. Muskegon Development Co. completed discovery well in this horizon back in 1942. Oil produced was a 22.0°-gravity crude. This original well has since been plugged.

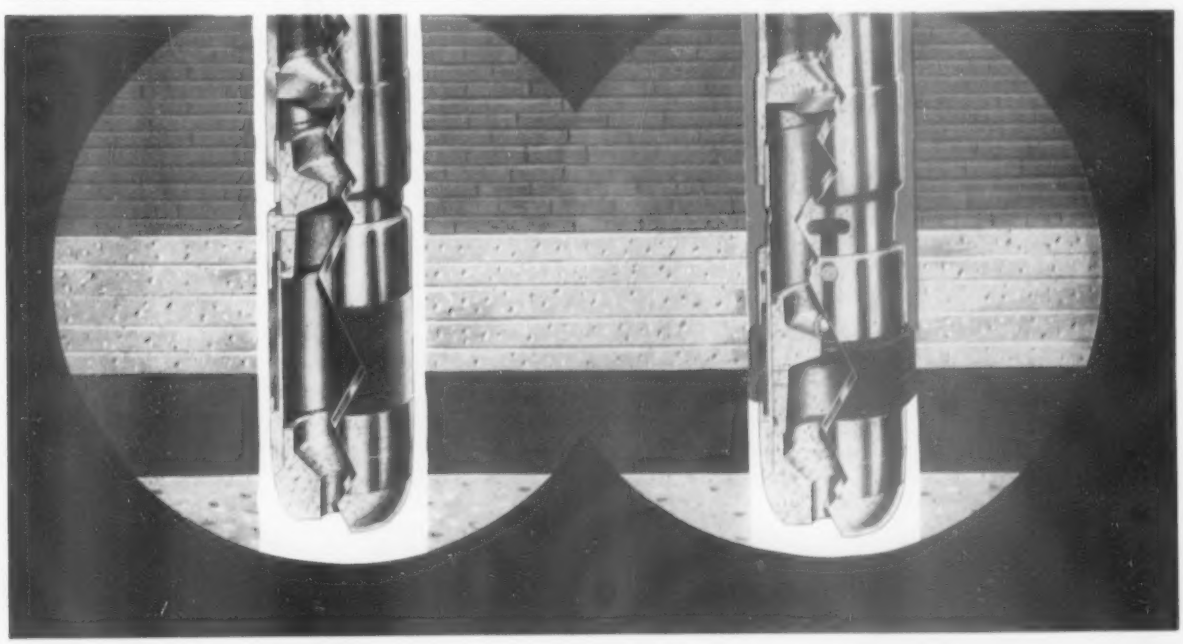
- Clifford A. Perry logged a Trenton gas pay, amount not accurately measured, at the 1 House-Knecht, NW SE NE 10-5s-3w, Scipio Township wildcat, Hillsdale County. Gas cleaned open hole of 600 ft. of water and cavings and flow could be heard a mile from well-site. Operations are temporarily shut down. Trenton objective was topped at about 3,563 ft. Gas showed between 3,575 ft. and present total depth, 3,603 ft.

ROCKY MOUNTAIN

MONTANA

Wolf Springs Report

Since the first of this year Wolf Springs field in Yellowstone County has been one of the most active areas



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in the Rockies. Carter Oil Co. has drilled seven oil wells in the field since January, and has announced location for the eighth well in their series. The 1 Charles Horton will be located in 20-7n-32e.

Carter Oil Co. and Atlantic Refining Co. are the major operators in this field. There are 18 producing wells in the Amsden dolomite reservoir. In 1944, after leasing much land and doing intensive seismic work, Carter drilled its first well in the immediate area. It was about 3 miles southeast of the present field, went down to 8,600 ft., and was dry.

Last year, Carter supported the discovery well which came in flowing 370 bbl. of oil per day. Production in the field is from the Amsden dolomite at about 6,200 ft. Location of the field is 50 miles northeast of Billings. The wells average about 100 bbl. per day of 30°-gravity oil.

COLORADO

Oil Flows From Lakota At Canadian River

Cabeen Exploration Co. 2-B Blevins, SE SE NW 3-9n-78w, Jackson County, flowed oil at the rate of 118 bbl. daily on 24/64-in. choke from perforations in the Lakota-Cretaceous at 2,034-49 ft.

This North Park basin also flowed 5,100 M.c.f. of gas per day from the upper Dakota sand at 1,961-88 ft. on drill-stem test. The 2-B Blevins is the first well in this field to flow oil. Location is ½ mile northwest of the 2 Blevins, the second well in the field and a new-pay discovery. It flowed 21,000 M.c.f. of gas per day from Dakota and Lakota. The field's discovery well, completed earlier this summer, the 1 Blevins, was a muddy gas discovery, completed for 6,000 M.c.f. per day.

Location of Canadian River field is about 5 miles southeast of Battleship field and 4 miles east of North McCallum oil and gas field . . . a Dakota, Lakota, and Morrison producer. Cabeen will drill five field wells in 3, 10, and 11-9n-78w.

Good Gas Flow Reported At Bents Fort Field

The extension well to recently-opened Bents Fort field in Bent County, southeastern Colorado, flowed gas at the estimated rate of 10,800 M.c.f. per day from Morrow-Pennsylvanian perforations at 5,208-28 ft. The extension discovery is Stansbury Oil Co. 2 Coordes & Oberlander, NE SW SW 21-21s-51w.

The Morrow perforations also flowed

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oil at the rate of 55 bbl. daily, cut 50 per cent water. The discovery well at Bents Fort, completed in 1955, flowed 50 bbl. of oil per day from the Atoka-basal Pennsylvanian and 440 M.c.f. of gas per day from the Morrow. Location of the field is 10 miles northeast of Las Animas on the Las Animas arch. The field's discovery established first oil production in southeastern Colorado.

NEBRASKA

Red Willow Discovery Is Confirmed

The Red Willow Cambridge arch discovery at Barger field has been confirmed. The successful confirmation discovery is Superior Oil Co. 46-6 Stephens, SE NE SW 6-4n-30w. Superior completed the well for 194 bbl. of oil per day on pump from the Lansing-Kansas City-Pennsylvanian.

The confirmation of this important discovery area on the Cambridge arch will spark development drilling and more exploration in this section of Nebraska. It marks the third oil completion on the arch in recent months, the other being in Decatur County, Kansas.

ARIZONA

Apache County Discovery Awaits Completion

Completion of Arizona's second producing area's discovery well is near. Franco-Western Oil Co. of Bakersfield recovered gas on a drill-stem test of the Paradox-Pennsylvanian at the 1 Navajo in SW NW 22-41n-28e, Apache County.

This newest discovery of utmost importance to the Four Corners region is 4 miles south of East Boundary Butte field, the state's first and only producing area. The Franco-Western well reportedly flowed 5,000 M.c.f. of gas per day from an interval of 60 ft. at about 5,355 ft. Successful completion will give the state three producing wells. East Boundary Butte has two.

WESTERN CANADA

ALBERTA

Wet Gas Discovery Assured at Westerose Test

A team headed by Canadian Oil Companies, Ltd. and including The California Standard Co., Husky Oil & Refining, Ltd., and Phillips Petroleum Co. of Oklahoma has been assured of wet gas production from the D3 zone of Devonian at an exploratory well in the Westerose area of south-central Alberta. This well, 8 Davidson, is situated 2¼ miles north-northeast of the most northerly D3 oil completion in Homeglen oil field and lies 9 miles south of the proved limits of Westerose oil pool.

Davidson No. 8, is located on LSD 8, 8-44-1w5 and topped the D3 formation at 7,303 ft. Initial test in the D3 horizon, of the interval 7,301-08 ft. flowed natural gas in 2 minutes and after 25 minutes, rate was measured at 9,600 M.c.f. daily. Second test from 7,307-20 ft. registered a gas flow at rate, 5,300 M.c.f. daily. There were condensate recoveries on both tests. Latest available depth was 7,339 ft., and crew was cutting a further core in the discovery horizon.

Paddle River Test Yields Gas and Oil

Honolulu Oil Corp. has discovered gas and yielded a show of light gravity oil during a pair of drill-stem tests recently conducted at its 16-17 Paddle River wildcat venture lying in an area 65 miles west-northwest of Edmonton's city limits. The well lies on a spread of exploration rights farmed out by Cities Service Petroleum Corp. to the team of Honolulu and Merrill Petroleums, Ltd.

This discovery well is on LSD 16, 17-56-8w5. During drill-stem tests conducted around the 5,050-ft. level, in the Nordegg formation, gas flowed to the surface at maximum 5,370,000 cu. ft. daily on the initial test and 2,000,000 cu. ft. daily on the second. Recoveries of 4 ft. of oily distillate and 20 ft. of dark oil respectively, were made on the tests.

Crew has since reached total depth in the Mississippian and set casing to bottom. Mississippian drill-stem tests were not reported.

Wabamun Oil and Gas Found at Big Lake

Imperial Oil, Ltd.'s 5-25 Big Lake exploratory venture reported last week to have found gas and oil in the Wabamun formation of Devonian, this week opened up the D2 or Nisku zone of the same formation and flowed oil during a series of drill-stem tests run in it.

This well, Imperial 5-25 Big Lake, on LSD 5, 25-53-26w4, 1¾ miles north of the most northerly producer in the Acheson-Stony Plain oil field and 1¾ miles south of the Stanolind, et al. 2 D3 St. Albert (Leduc) oil completion.

Drill-stem tests in this horizon were run around the 4,350-ft. mark, covering a 92-ft. section flowed gas at maximum 700,000 cu. ft. daily during the initial test, which also recorded the oil flow;

363,000 cu. ft. daily on second which gave up 900 ft. of gassy oil; 100,000 cu. ft. daily on the third and a pipe recovery of 720 ft. of gassy oil. The last test in the zone recorded a recovery of 210 ft. of oil-cut gassy muddy salt water.

BRITISH COLUMBIA

Two Gas Strikes Reported At Blueberry Mountain

Two exploratory tests currently being drilled by a group headed by J. B. White and A. M. Lloyd of Dallas, Tex., in the Blueberry Mountain area of northeastern British Columbia have assured their backers of gas successes. The progress report on the pair of wells presently under way, White-Lloyd 3 Halfway, and White-Lloyd 10 Blueberry, was announced by Fargo Oils, Ltd., one of the other participants in the project. The other firm interested in these wells is Gulf States Oil Co. of Canada.

The 3 Halfway well, situated on LSD 12, 12-87-25w6, was reported productive of gas in the top portion of the Triassic and is now being deepened to test a lower zone in that same formation, the Permo-Penn, Upper Mississippian and Rundle. Three drill-stem tests run in the upper portion of the Triassic flowed gas at rates up to 4,000,000 cu. ft. daily.

The other well, 10 Blueberry, on LSD 7, 9-90-25w6, found its gas in a Dolomitic sand in the Paleozoic formation. Drill-stem test around the 6,800-ft. level flowed gas at an estimated 10,000,000 cu. ft. daily. Some distillate was also recovered from the drill-stem. Crew is currently deepening the venture.

SOUTH TEXAS

TEXAS GULF COAST

Fort Bend Wildcat Opens New Oil Producing Area

Deeper drilling has uncovered a new producing area in eastern Fort Bend County. It is 6 miles northeast of Richmond with nearest production being 3 miles northwest in North Richmond field. It is 3 miles northwest of Sugarland townsite and about 6 miles northwest of Sugarland field.

The discovery is by Harrison & Carpenter at their 1 Knight, completed with a choked flow of 93.96 bbl. of 38°-gravity oil per day from perforated interval at 8,248-52 ft. Flow was with pressure of 2,100 psi. and gas-oil ratio of 4,200 cu. ft. per barrel.

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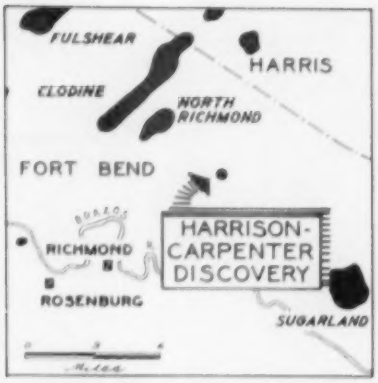

Location of Harrison & Carpenter oil-discovery (indicated) in eastern Fort Bend County.

Hockley Zone Produces in Live Oak County Discovery

Ralph Evans and Frank C. Kallina, San Antonio independents, have a new oil-discovery well 3 miles southwest of Dinero, in southeastern Live Oak County. It is their 1 Cartwright, spotted in G. W. Wright Survey. Completion is on the pump making 60 bbl. of 40°-gravity oil per day. Pay, in the first Hockley sand, is perforated at 4,429½-36 ft.

Location is about 1½ miles west of Mount Lucas field, productive from Frio-Vicksburg and Yegua sands. It is in the narrow gap between that field and the Pettus-Yegua production at McNeil field.

New Gas Area Opened in Eastern Jackson County

A new gas reservoir is being opened 5½ miles east of Ganada in eastern Jackson County, near the Wharton County line. Discovery well, 1 Heard, drilled by British Texan Oils, Ltd., flowed for 6 hours through ¼-in. choke before being shut in, for potential tests. Flow was ungaged but was under pressure of 1,900-2,000 psi. There was a trace of condensate. The gas zone is open through perforations at 6,020-30 ft. Hole was drilled to 6,838 ft. Location is northeast of East Mustang Creek field.

SOUTH LOUISIANA

Heavy Gas Flow Indicated In Wild Jennings Well

The old Jennings salt dome in Acadia Parish staged another comeback last week when a deep test a mile off the south flank blew out with a high-pressure flow estimated at more than 70,000,000 cu. ft. of gas per day.

The well, being drilled by Temple Hargrove and Frankfort Oil Co., blew out of control for nearly 3 days before bridging. The blowout occurred while the well, 1 Medlenka-Gueno and Bruner, was drilling below 10,125 ft. It blew all the drill-pipe out of the hole. Gas had a heavy spray of liquid, starting as a light-colored distillate and turning later to a darker-colored light oil.

Operators were circulating 20-lb. mud while cleaning up to resume drilling.

Jefferson Wildcat Opens New Gas-Condensate Field

A new field, productive initially of gas and condensate, is being opened just south of Harvey, across the Mississippi River from New Orleans, in Jefferson Parish.

Discovery is by The California Co. at its 1 Marrero Unit 3, in 44-14s-24e, which flowed during a 6-hour test through ⅝-in. choke at the rate of 80 bbl. of 50.1°-gravity condensate and 6,030,000 cu. ft. of gas per day. Flowing pressure gaged 3,520 psi.

Production is from 9,344-64 ft.

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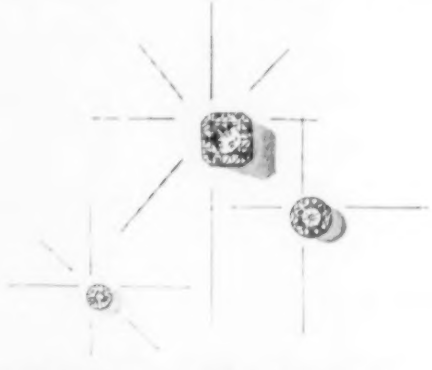

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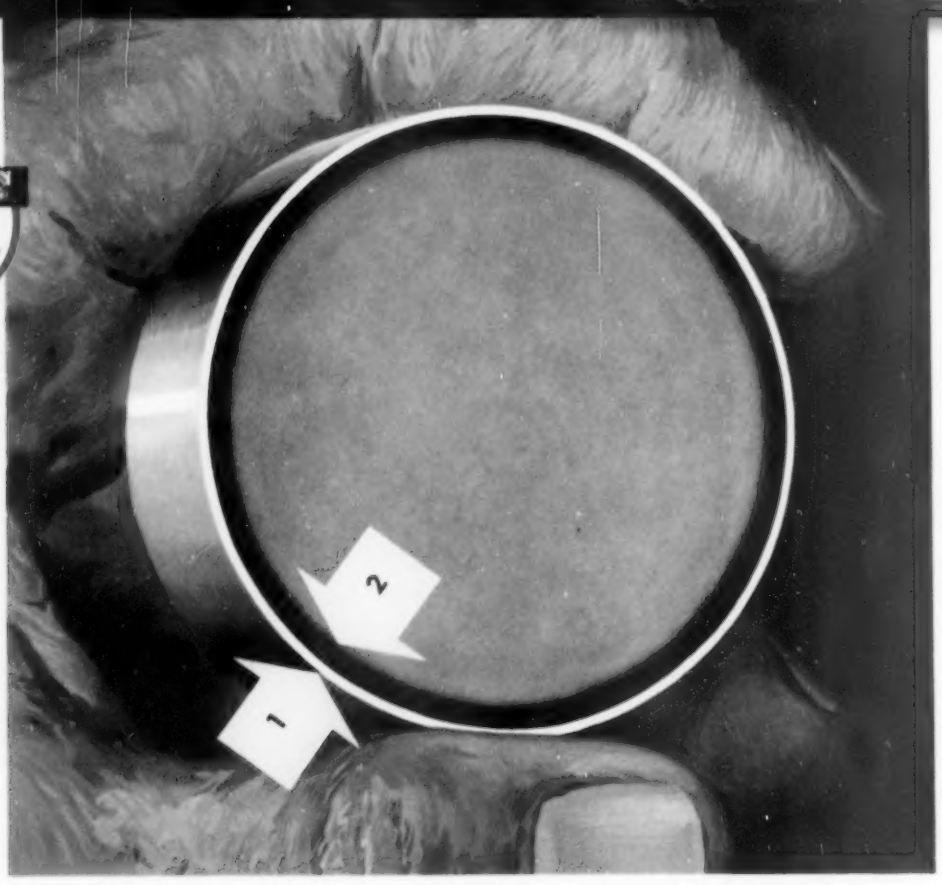

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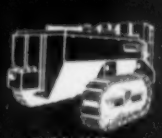
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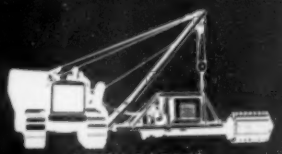
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A CHEMICAL engineer and research specialist will blend three subsidiary chemical companies into one chemical corporation for Standard Oil Co. (Ind.).

Picked to head the corporation as its first president is Jay H. Forrester. By the end of the year he expects to have Indoil Chemical Co., Chicago; Pan American Chemicals Corp., New York City; and Hidalgo Chemical Co., Tulsa, operating as a single corporation under the name of Amoco Chemicals Corp.

The chemical corporation will manufacture and supply basic chemicals for industry. No consumer products are scheduled for the present.

Found his niche . . . Back of Forrester is 27 years of research and management with Standard Oil and its producing subsidiary, Stanolind Oil & Gas Co.

He is 49, soft-spoken, with a hint of the Southwest in his slight drawl. He expects that Amoco Chemicals will grow as the industry keeps pace with a change in needs and demand for new products.

Forrester is a native Texan (Hillsboro), but he spent most of his boyhood in New Mexico. He moved to Chicago and lived with relatives for his senoir year in high school to facilitate his enrollment in college. He picked the University of Wisconsin.

He earned his B.S. degree in chemical engineering at Wisconsin in 1928. Forrester worked his way through the university, and still kept on the honor roll, and was elected to Tau Beta Pi, the engineers' Phi Beta Kappa.

Several jobs followed the year after his graduation, but Forrester didn't find his niche. So in the summer of 1929 he and a friend in a new Model-A Ford traveled 12,000 miles through the Far West, camping by the wayside. They visited all of the national parks.

The research laboratory of Standard Oil at Whiting, Ind., lured him in the fall of 1929. He has been with the company since except for a year's leave of absence to study at Massachusetts Institute of Technology, where he received his M.S. in chemical engineering in 1932.

Tackled many jobs . . . Forrester worked on many refinery problems at Whiting while on the research staff. In 1940 he was promoted to associate director of research and director of technical service.

World War II meant service as a member of several industry committees to help the war effort. Two major chores involved the production of toluene and aviation gasoline which were in short supply and in great demand.

Forrester shifted to Tulsa and Stanolind in 1946 for a stint as manager of the manufacturing department. A promotion in January 1951 sent him to Oklahoma City, and the post of central division manager.

The parent company called Forrester back to Chicago and its general office in January 1952 to become manager of research. He took on an extra responsibility in January 1955. He became president of Calumet Nitrogen Products Co., established jointly by Indiana Standard and Sinclair Refining Co. to build and operate an ammonia plant at Hammond, Ind.

Forrester is a member of the American Chemical Society and the American Institute of Chemical Engineers. He also belongs to the Society of Automotive Engineers, American Petroleum Institute, and Armed Forces Chemical Association. He is a member of Alpha Chi Sigma and Phi Lambda Upsilon, professional chemical fraternities.

Forrester also is an advisor with other civilian consultants on the fuels and lubricants panel of the assistant secretary of defense for research and development.

He likes to sleep . . . There is nothing high pressure about him, in fact, he admits he likes to sleep—but not on the job.

He plays a "poor and infrequent" game of golf. He likes to vacation in the West at dude ranches with his wife and their son Bill, 12, and their daughter, Penny, 19. Forrester enjoys horseback riding—prefers a western saddle—but isn't much of a winter sports enthusiast.

Forrester is right at home over a campfire, or a kitchen range. He is somewhat of a gourmet when it comes to barbecues. His children won't eat dressing unless he makes it, so he stuffs their Thanksgiving turkey.

His success at cooking he attributes to never preparing any dish the same way twice—he cooks by aroma, adding this or that until his nose tells him the flavor is just right.

Chances are some of this attitude will carry into his new position. He anticipates a few problems, but undoubtedly will overcome them with a little of this and a little of that based on his experience. After Amoco Chemicals Corp. lives through the first year, he said, he is confident it will do all right.

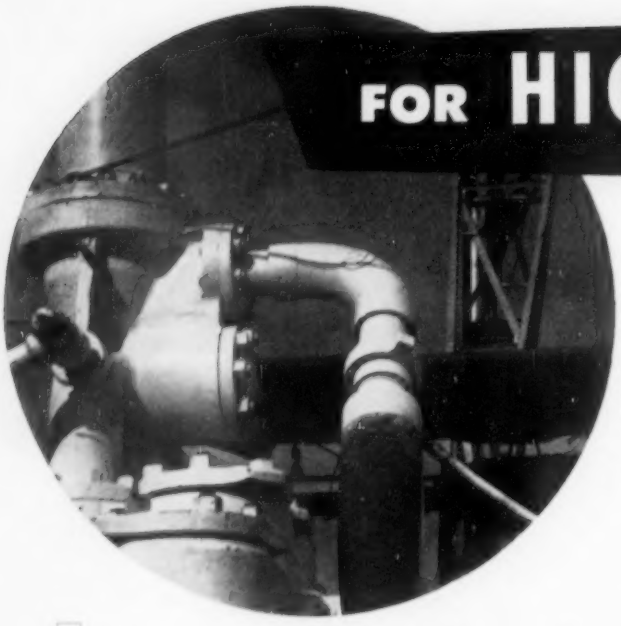
J. H. Morris, Gulf Coast division geologist with Sohio Petroleum Co., has been named district exploration superintendent with headquarters in Lafayette, La.

Robert L. Zinn has left his position as geologist with Pan American Production Co. to form Zinn Petroleum Co. in Lafayette, La.

Loren Keenan, chief engineer and director of Natural Power Corp., has been elected president of the firm. He succeeds **H. E. Richards,** who will continue as a director.

Marshall Rhoads, president of Big One Drilling & Production Co. and Nu Way Oil Corp., Taylorville, Ill., has moved general offices of both companies to Tulsa. **F. E. (Dusty) Rhoads,** Nu Way vice president and general manager of Big One, will also move to Tulsa. **Jack Graves,** formerly chief area geologist with Phillips Petroleum Co., has also joined Big One in Tulsa as area geologist.

David Rich, president of Rich Oil Co., formerly of Houston, and **Adolph Uzick,** office manager, have opened the company's new main office in Tulsa. They join **J. D. (Bill) Drew,** production superintendent, who has been located in Tulsa for the past year. Rich officials have recently formed the O. K. & T. Oil & Gas Co., also with Tulsa offices, to carry out operating and drilling activities.



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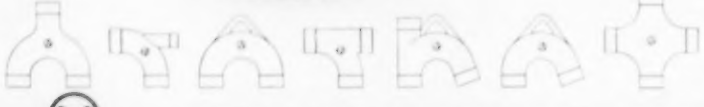

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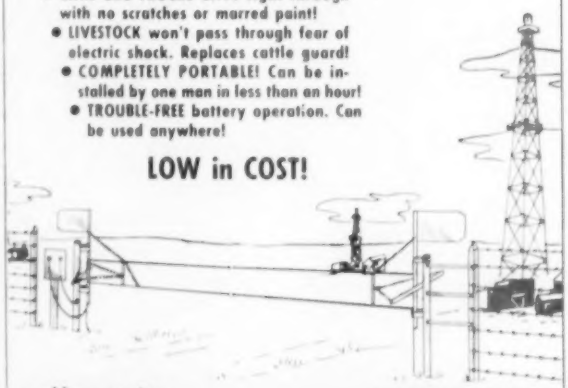

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Russell J. Alexander, geologist with The California Co., has been transferred from Whittier, Calif., to Pensacola, Fla.

Ralph D. Jackson, assistant chief engineer with Sohio Pipe Line Co., has been promoted to chief engineer.

Francis G. Hester, chief engineer and assistant maintenance superintendent for Great Northern Oil Co.'s Pine Bend, Minn., refinery, has been named maintenance and engineering superintendent. Hester was with Great Southern Chemical Corp., Corpus Christi, Tex., before joining Great Northern in 1955.

Pete Slaybaugh, district engineer with Continental Oil Co., has been transferred from Galena Park, Tex., to Rio Grande City, Tex.

Wallace K. Reaves, geologist with Continental Oil Co., has been transferred from Texarkana, Tex., to Forest, Miss.

Robert W. Rea, section superintendent with Gulf Interstate Gas Co., has been transferred from Corinth, Miss., to Water Valley, Miss.

Seymour Van-Os, Jr., formerly geologist-engineer with various East Texas independents, has opened offices as a consultant petroleum geologist in Kilgore, Tex.

Charles A. Houston, district geologist with Stanolind Oil & Gas Co. at Jackson, Miss., has been promoted to district exploration superintendent. **A. T. Teague, Jr.,** succeeds Houston as district geologist at Jackson. Teague has been district geologist for Pan American Production Co. in Shreveport.

Charles Leet has been appointed vice chairman of the operation coordination committee of Creole Petroleum Corp. He replaces **W. A. M. Greeven,** who has been appointed deputy coordinator of marketing for Standard Oil Co. (N. J.).

Frank Manning has been appointed general superintendent of Pure Oil Co.'s Rocky Mountain Division. He succeeds **Ches M. Harden,** who has been named general manager of drilling and production for the four-company group (Pure, Signal Oil & Gas Co., Hancock Oil Co., Standard Oil Co. of Ohio) recently awarded a 28,000-acre concession in Lake Maracaibo, Venezuela.

Thomas J. Devine, independent oil operator at Midland, Tex., has been elected a director of Zapata Off-Shore Co., Midland.

Robert J. Belknap has been named managing director of Standard-Vacuum Oil Co. (East Africa), Ltd., at Nairobi. He succeeds **L. H. Tremaine,** who has retired. **John R. Kendall** will replace Belknap as general manager of Standard-Vacuum Sales Co. in Indonesia.

Joe L. Carey has been named head of the geological department of General Crude Oil Co.'s Abilene, Tex., office. He replaces **J. C. Barker,** district geologist, who has been transferred to Houston. **Charles E. Jones** has joined the company in Abilene as an engineer.

Doyle G. Marrs, petroleum engineer with Magnolia Petroleum Co. at Houston, has been promoted to district petroleum engineer and transferred to Midland.

W. M. Jacobs, vice president and assistant general manager of the Southern California Gas Co., has been elected vice president of the firm's parent company, Pacific Lighting Corp.

J. A. Anderson, Jr., has been promoted to research associate, and **E. W. Bowerman** to assistant division head in

ANDERSON

BOWERMAN

the research and development division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. Anderson received a B.S. degree in chemical engineering from the University of Illinois, and an M.S. from Pennsylvania State University. Bowerman is a graduate of South Dakota State School of Mines and holds a Ph.D. degree in chemistry from Ohio State University.

Dr. L. Marshall Welch has been appointed director of research by Petro-Tex Chemical Corp. with headquarters in the company's Houston laboratories. Welch will continue in charge of petrochemical research for the central research laboratory of the Chemicals Division, Food Machinery & Chemical Corp. **Dr. Calvin N. Wolf** will succeed Welch on petrochemical research at the central research laboratory in Princeton, N. J.

Personals

Carl Burgehardt, geologist with Ohio Oil Co. at Sidney, Colo., has resigned to join Petroleum, Inc., Denver.

Alan R. Bailey has been named senior vice president of Southern Counties Gas Co., Los Angeles, effective October 1. Bailey currently is assistant to the president of Pacific Gas & Electric Co., San Francisco.

Joe B. Hudson, vice president in charge of exploration for Monterey Oil Co., has been named a director. He joined Monterey in 1953 after serving 20 years with Humble Oil & Refining Co.

Carrol M. Bennett, of Bennett, Osborne & Hall management counselors of Dallas, has been named executive director of operations of the Frankfort Oil Co., Bartlesville, Okla. **Harry H. Mack,** Dallas independent and production consultant, has been appointed operations manager of the company. Prior to 1946, Mack was a vice president and director of the old Sunray Oil Corp.

Donald W. McGee, assistant to the general manager of Sahara Petroleum Co.'s domestic offices, has been transferred from Ponca City, Okla., to New York City in a move to change domestic office headquarters to New York. Sahara's operator is Continental Oil Co. Sahara's main office is in Alexandria, Egypt.

Dr. James A. Tong has been elected president of Socony Mobil Oil Co. de Venezuela. Tong succeeds **John C. Case,** a director and vice president in charge of production of the parent company, Socony Mobil Oil Co., Inc. **H. R. Moorman** replaces Tong as executive vice president of the Venezuelan affiliate. Moorman was formerly manager and executive vice president of Socony Mobil's Canadian affiliate, Mobil Oil of Canada, Ltd. In other Socony personnel changes, **Edwin F. Helser,** geophysical operations supervisor at Caracas, has been transferred to Ankara, Turkey, as chief geophysicist of Mobil Exploration Mediterranean, Inc. **J. Howard Casey,** former assistant to the exploration manager, has been named assistant manager of exploration. **T. C. Keating,** senior geologist at Caracas, has been transferred to New York as staff geologist. **K. W. Wiseman,** reservoir engineer at Caracas, and **J. E. Fender,** senior engineer at Caracas, have been transferred to New York as staff engineers.

Personals

Ken Sharp has joined Central Oil Corp. as geologist in Denver.

Ted Moore, district engineer with Cities Service Oil Co., has been transferred from Oklahoma City to Lafayette, La.

R. C. Swagler, assistant district superintendent with Peoples Natural Gas Co. in Monongahela, Pa., has been promoted to district superintendent and transferred to Glenshaw, Pa.

Carl C. Georgian has been appointed group leader in the technical service division of the research and development department of American Oil Co., Texas City, Tex. Georgian joined the company in 1952.

Jack H. Hendrickson, district geologist for Pan American Production Co. in Abilene, Tex., has joined the Chicago Corp. at Midland, Tex., as district geologist and manager.

John W. Towler has been appointed director of manufacturing for Union Oil Co. of California. Towler was formerly manager of Union's Wilmington refinery. **W. T. Jameson** has been named manager of the refinery.

James W. Bateman, technical assistant to the manager of manufacturing for Continental Oil Co. in Houston, has been promoted to director of the new projects division of the coordinating and planning department.

James M. Brittain, gas measurement engineer with Stanolind Oil & Gas Co. at Andrews, Tex., has joined Superior Oil Co. as gas engineer at Midland, Tex.

H. E. Collison, assistant division manager for Continental Oil Co., has been named district manager of the company's new marketing district in Oklahoma City.

William E. Perkes, chief petroleum engineer for Tidewater Oil Co.'s Saskatchewan project, has been promoted to manager of production. Tidewater is operator of the project, which includes Atlantic Refining Co., Columbian Carbon Co., Ohio Oil Co., and Tidewater. **W. H. Roe,** senior reservoir engineer in Tidewater's Regina office, succeeds Perkes as chief petroleum engineer. **W. Cole Sylvester,** chief production engineer for the project, has been transferred to the Tulsa office of Ohio Oil Co. as assistant divisional engineer.

C. L. Larson, Rocky Mountain region manager for Stanolind Oil & Gas Co., has been elected a vice president of the company.

Joseph R. McHugh has been named superintendent of the Newark, N. J., plant of Commercial Solvents Corp.

Bob V. Barker has been named division production superintendent for the Oklahoma division of Shell Oil Co. He succeeds **O. L. Nuernberger,** who has been transferred to Centralia, Ill.

Kenneth W. Bull, district production superintendent with Josaline Production Co., has been transferred from Bristow, Okla., to Cushing, Okla.

H. H. Mayfield, driller for Monarch Drilling Co. in Oklahoma City, has joined Murfin Drilling Co. in Wichita, Kans.

James H. Eiffert, on leave from The Texas Co. to serve with the U. S. Army, has rejoined the company as a geologist at Corpus Christi, Tex.

Wilson (Dub) Reed, formerly geologist with Continental Oil Co., and **Wayne J. Moore,** formerly with Union Oil Co., have joined the geological staff of Murphy Corp., Billings, Mont.

Frederick D. Douglass, manager of Forest Oil Corp.'s water-flood department, has been promoted to general manager of Forest Colombian Corp. and transferred to El Centro, Colombia.

D. H. CLEWELL

Dayton H. Clewell, manager of Magnolia Petroleum Co.'s field research laboratories at Dallas since 1952, has been named manager of Socony Mobil Laboratories at New York. **C. I. Alexander,** now supervisor of the exploration research division at the Magnolia laboratories, will succeed Clewell as manager there. **P. P. Reichertz,** supervisor of production research, will become assistant manager of the lab at Dallas along with handling his present duties. **N. P. Stevens** will replace Alexander as supervisor of exploration research. Clewell joined the Magnolia geophysical department in 1938. He was transferred to the laboratories in 1942 as supervisor of physical research and was named manager of the lab in 1952. Alexander joined Magnolia as a paleontologist at Shreveport in 1933. He was transferred to the Dallas general offices in 1951 as a regional exploration geologist and became supervisor of exploration research at the lab in 1952.

Dr. Carl C. Tongberg, vice president and director of Esso Research & Engineering Co. in Linden, N. J., has been elected a vice president and director of Carter Oil Co. and transferred to Tulsa. He will direct production research activities of Carter on behalf of the producing affiliates of Standard Oil Co. (N. J.).

DEATHS

Seth W. Herndon, Sr., founder and president of the Herndon Oil Drilling Co., died August 21 in Tulsa after a heart attack. A graduate of the University of Missouri, Herndon was associated for many years with Bu-Vi-Bar Drilling Co. During World War II he served as District 2 director of natural gas and natural gasoline for Petroleum Administration for War.

C. L. Butler, 58, former president and chairman of the board of the old Roosevelt Oil & Refining Corp., Mount Pleasant, Mich., died August 14 in Indian River, Mich. Butler joined Roosevelt in 1940 as sales manager. He retired in 1949.

Richard W. (Dick) Jernigan, 48, president and general manager of Majestic Contractors, Ltd., Edmonton, died August 6 in Bemidji, Minn. Formerly with Anderson Brothers Corp., Jernigan founded Majestic in 1953. His death followed a major gall-bladder operation.

John N. Huber, 43, former geologist for many Rocky Mountain area and California oil firms, died August 13 while in Casper, Wyo., on business. He was a partner in Cordilleran Co. of California. Huber's former employers include Shell Oil Co., Continental Oil Co., and J. Ray McDermott & Co. of Denver.

Charles E. Wilcox, 89, oil industry pioneer and inventor, died August 19 in Huntington Beach, Calif. Credited with drilling the first producing well in Utah, Wilcox began his career with the original Standard Oil Co. in Maxbury, Ohio.

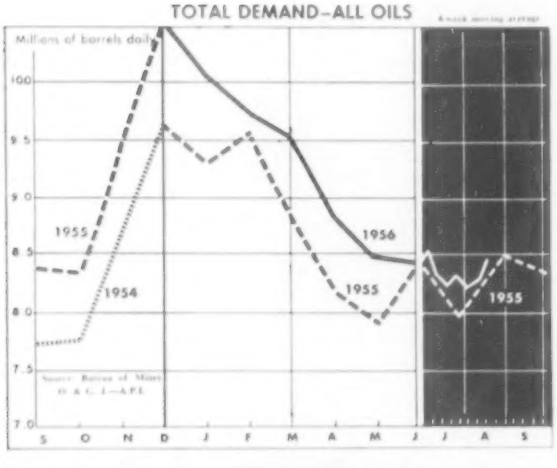
Charlie Scales, 65, field engineer for Shell Oil Co., died August 16 in California.

Lloyd R. Hawley, president of Big West Oil Co. of Montana, died August 21 in Spokane, Wash.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,123,975	UP	37,450	UP	440,575
Crude stocks	274,389,000	DOWN	3,833,000	UP	9,872,000
Completions	1,278	UP	70	UP	114
Refinery runs	7,899,000	DOWN	86,000	UP	394,000
Gasoline stocks	176,202,000	DOWN	1,355,000	UP	20,639,000
Kerosine stocks	30,717,000	UP	1,085,000	DOWN	2,840,000
Distillate stocks	128,934,000	UP	4,761,000	UP	3,712,000
Residual stocks	44,996,000	DOWN	545,000	DOWN	1,353,000
Four-product stocks	380,849,000	UP	3,946,000	UP	20,158,000
Total imports	1,324,800	UP	111,900	UP	284,100



Surplus Gasoline Puts More Pressure On End-of-the-Season Markets

GASOLINE markets have become increasingly softer in recent weeks under the influence of slightly lower demands and continued high refinery production.

Many of the larger marketers in the North Central and Mid-Continent areas were buying gasoline early in the season. Some had discontinued outside purchases by the middle of July, and at the present there are no reports of purchases by refiners in the open Group 3 market. A few may be taking material contracted for earlier in the season.

Private-brand distributors along the Great Lakes pipeline are buying regular gasoline on the spot market at 11.25 cents a gallon plus pipeline charges. If any refiner needs a little extra gasoline, he probably can locate material for the interrefinery sale at 11.00 cents plus pipeline-transportation charges.

Market rumors indicate that Mid-Continent refiners are becoming concerned about the deterioration of the gasoline market. Total gasoline in the Mid-Continent and North Central areas amounts to about 6,500,000 bbl. more than a year ago. Normal increases in stocks to cover higher demands could account for about 1,000,000 bbl. of the extra material. The remaining 5,500,000 bbl. is surplus which casts a much darker shadow now than it would have at the beginning of summer.

The total for all gasoline stocks in the Gulf Coast and East Coast areas is 11,200,000 bbl. more than last year at this time. This surplus has been putting pressure on the Gulf Coast market all summer. Also, the extra material available on the Gulf Coast has made it more difficult for marketers to maintain breakeven prices in the price-war areas of the East Coast.

By the middle of August, three major suppliers were fair-trading gasoline in Pennsylvania. Also, Esso Standard Oil Co. raised its tank-wagon price by 0.8 cent a gallon in eastern Pennsylvania, following a similar increase by Atlantic Refining Co.

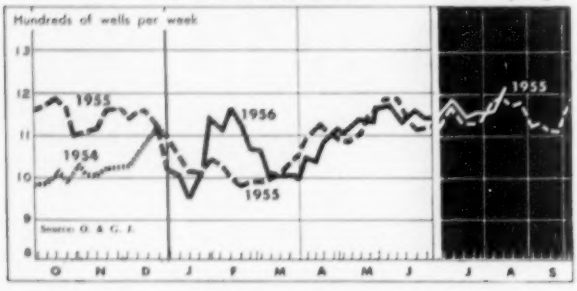
For the three-state area of Massachusetts, Connecticut, and Rhode Island, six of the important marketers are fair-trading gasoline. These are artificial but necessary measures to prevent the complete collapse of the gasoline market in this important area.

The Gulf Coast gasoline market is suffering from a surplus of refiners who need to sell some gasoline or at least would like to move some on the open market. The picture is made blacker still by the fact that there isn't even one important marketer who is in the market for Gulf Coast gasoline.

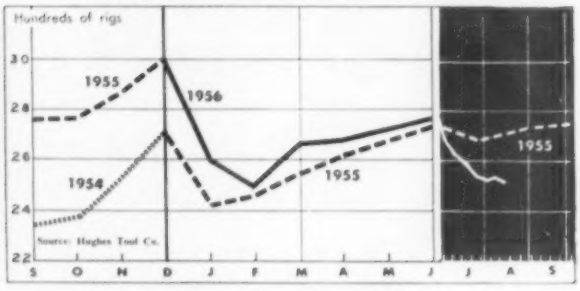
The price situation on the Gulf Coast reflects the above picture. Any marketer who needed a cargo of Gulf Coast gasoline over the past few weeks could have had the material at 0.25 cent or perhaps 0.375 cent under normal quotations. Gulf Coast refiners have not lowered their quotations because of the shortage of prospective customers to whom the offers could be made.

The lows of Gulf Coast gasoline prices have been reduced this week by 0.25 cent a gallon. This does not represent a distinct change in the market but indicates the gradual softening of the market which has reached the point where the old low quotation does not reflect actual conditions.

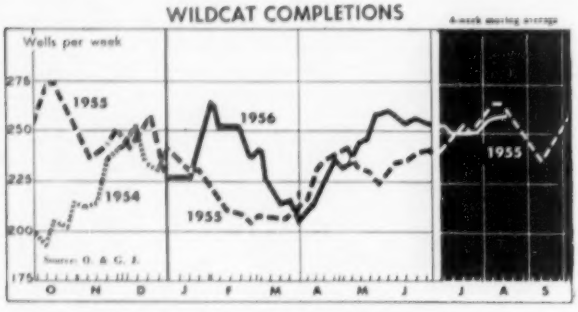
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	8-20-56	8-13-56	8-22-55
North Central and East	127	125	151
Southeast	31	40	29
Okla., Kans., Ark., Mo.	443	450	540
Louisiana	442	467	427
North and East Texas-Panhandle	364	356	382
Gulf and South Texas	232	227	259
West Texas-New Mexico	478	490	518
Rocky Mountain	274	262	319
Pacific Coast	118	108	138
Total United States	2,509	2,525	2,763
Western Canada	275	241	204

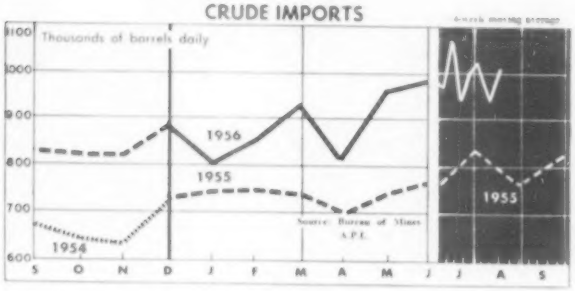
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 18, 1956

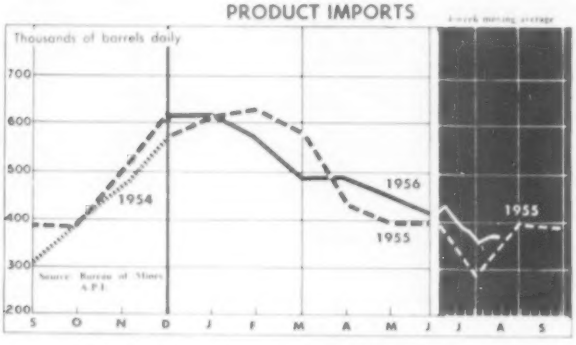
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	1	0	0	11,446	67	49	0	0	0	0	0	0	0	1	29	30
Arkansas	15	9	0	6	57,352	526	493	0	0	0	2	2	26	0	3	86	115
California	43	31	1	11	209,849	1,389	1,579	0	0	1	7	8	31	0	6	271	308
Colorado	18	1	4	13	96,303	740	921	0	0	0	12	12	18	0	11	345	374
Illinois	78	34	2	42	167,697	2,424	2,416	2	0	1	18	21	34	0	2	439	475
Indiana	16	4	0	12	30,033	412	473	0	0	0	3	3	13	0	1	74	88
Kansas	75	33	6	†36	240,936	3,243	3,233	0	0	0	16	16	76	2	19	581	678
Kentucky	46	15	8	23	77,159	1,137	885	0	0	0	10	10	26	0	1	240	267
Louisiana	91	41	6	44	673,353	2,446	2,498	4	1	0	13	18	80	36	41	331	488
North	50	28	3	19	194,853	1,032	1,314	1	1	0	5	7	21	2	3	134	160
South	35	10	3	22	418,277	1,132	1,184	3	0	0	7	10	47	30	26	174	277
Offshore	6	3	0	3	60,223	282	...	0	0	0	1	1	12	4	12	23	51
Michigan	5	3	0	2	11,021	279	329	1	0	0	2	3	6	0	1	95	102
Mississippi	8	2	0	6	48,887	281	300	0	0	0	2	2	12	1	1	118	132
Montana	11	5	1	5	61,581	258	218	0	0	1	5	6	10	0	1	80	91
Nebraska	26	7	0	19	159,743	654	495	0	0	0	12	12	27	0	0	290	317
New Mexico	32	16	9	7	158,020	1,205	1,042	1	0	0	5	6	33	0	6	116	155
Northwest	12	2	9	1	54,110	474	331	1	0	0	1	2	5	0	5	36	46
Southeast	20	14	0	6	103,910	731	711	0	0	0	4	4	28	0	1	80	109
North Dakota	8	2	0	6	44,416	159	150	0	0	0	4	4	8	0	0	42	50
Ohio	30	18	6	‡6	63,093	637	727	0	0	0	0	0	0	0	1	5	6
Oklahoma	149	100	6	§43	514,564	5,465	5,589	1	0	1	10	12	80	16	27	446	569
Pennsylvania-New York	121	44	40	¶37	298,483	747	1,042	0	0	0	0	0	0	0	5	11	16
Texas	464	300	9	155	1,913,573	14,240	12,778	15	1	1	93	110	482	24	118	2,968	3,592
Southwest (1 & 4)	53	29	2	22	217,723	2,066	1,966	4	0	0	15	19	92	5	43	559	699
Gulf Coast (2 & 3)	43	29	2	12	277,519	1,681	1,618	0	1	1	4	6	44	12	40	436	532
East (5 & 6)	22	6	1	15	113,379	722	622	0	0	0	9	9	10	1	5	246	262
N. Central (7-B & 9)	175	97	0	78	486,606	5,120	4,817	5	0	0	42	47	209	0	6	1,200	1,415
West (7-C & 8)	137	109	0	28	668,346	3,799	3,118	6	0	0	23	29	115	0	9	484	608
Panhandle (10)	34	30	4	0	150,000	852	637	0	0	0	0	0	12	6	15	43	76
Utah	4	1	0	3	23,052	83	56	0	0	0	2	2	3	0	3	43	49
West Virginia	21	6	11	4	59,315	417	379	0	0	0	0	0	0	0	6	7	13
Wyoming	15	5	2	8	56,251	505	525	0	0	0	5	5	9	0	7	127	143
Miscellaneous	1	0	0	1	6,500	65	21	0	0	0	1	1	4	0	0	53	57
Total United States	1,278	678	111	489	4,982,627	*37,179	36,198	24	2	5	222	253	978	79	261	6,797	*8,115
Total previous week	1,208	654	84	470	4,825,381			25	4	7	233	269	954	77	257	6,576	7,864
Total Aug. 20, 1955	1,164	657	96	411	4,412,187			33	3	7	184	227	1,045	135	235	6,243	7,658
Cumulative 1956	37,179	20,409	2,544	14,226	150,456,569												
Western Canada	60	46	2	12	245,536	1,834											

Service wells included: †2, ‡1, §8, ¶27. *Revised.

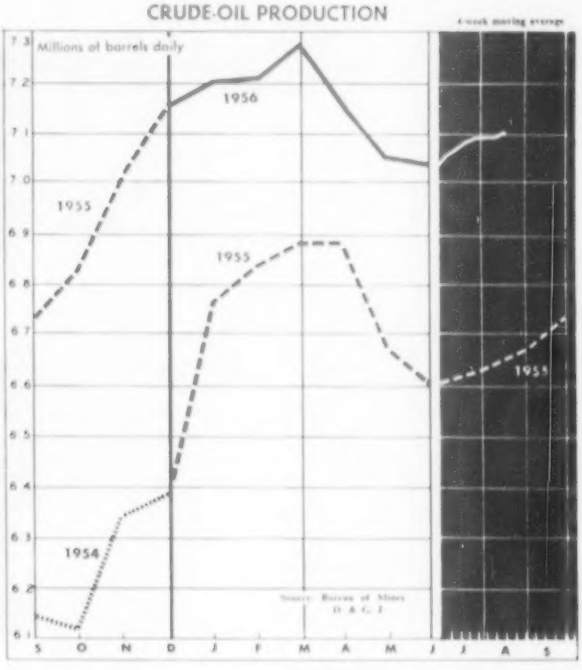
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

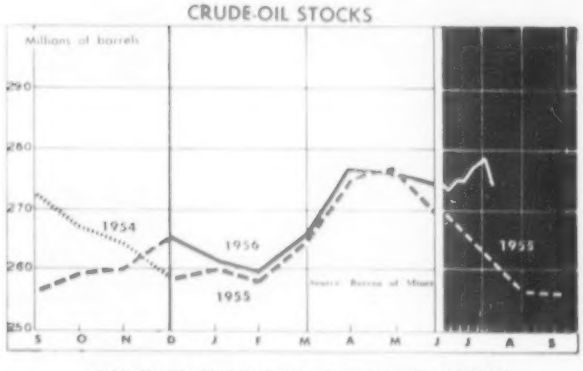


DAILY AVERAGE PRODUCTION FOR WEEK

	August 18, 1956			Aug. 11
	Crude oil	Lease condensate	Total	total
Alabama	7,500		7,500	7,600
Arkansas	75,800	450	76,250	76,000
California	960,400		960,400	960,800
Colorado	158,800		158,800	156,300
Eastern	50,600		50,600	50,100
Florida	1,375		1,375	1,375
Illinois	230,400		230,400	228,700
Indiana	31,600		31,600	31,100
Kansas	343,500		343,500	342,300
Kentucky	46,700		46,700	48,400
Louisiana	735,500	55,700	791,200	790,800
North	121,500	2,200	123,700	123,300
South	614,000	53,500	667,500	667,500
Michigan	28,800		28,800	28,500
Mississippi	107,900	4,650	112,550	112,550
Montana	63,200		63,200	62,700
Nebraska	38,600		38,600	37,200
New Mexico	229,500	3,800	233,300	233,100
North Dakota	37,700		37,700	37,600
Oklahoma	587,800		587,800	560,700
Texas	2,980,500	47,800	3,028,300	3,028,300
Dist. 1	56,000	425	56,425	56,425
Dist. 2	146,000	7,925	153,925	153,925
Dist. 3	436,000	22,400	458,400	458,400
Dist. 4	239,000	5,700	244,700	244,700
Dist. 5	43,000	350	43,350	43,350
Dist. 6	125,000	5,300	130,300	130,300
East Texas field	210,500		210,500	210,500
Dist. 7-B	158,000	50	158,050	158,050
Dist. 7-C	190,000	3,700	193,700	193,700
Dist. 8	1,060,000	1,500	1,061,500	1,061,500
Dist. 9	217,000	300	217,300	217,300
Dist. 10	100,000	150	100,150	100,150
Utah	5,500		5,500	4,900
Wyoming	289,700		289,700	287,300
Others	1200		1200	200
Total U. S.	7,011,575	112,400	**7,123,975**	7,086,525
Change from previous week, up			**37,450**	
Canada	†498,800		†498,800	‡429,500
Total U. S. production January 1-August 18			1,651,674,920 bbl.	
Same period last year (crude plus cond.)			*1,551,631,066 bbl.	

*Includes 25,808,850 bbl. condensate. †Week ended previous Monday. ‡Nevada.

CRUDE-OIL STOCKS

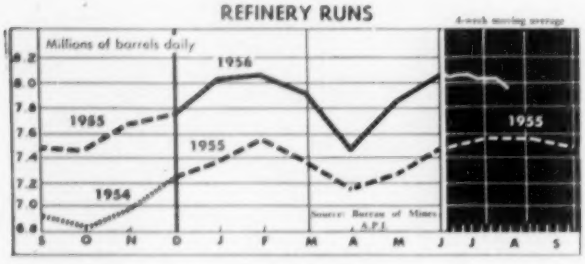


CRUDE-OIL STOCKS BY STATES OF ORIGIN*

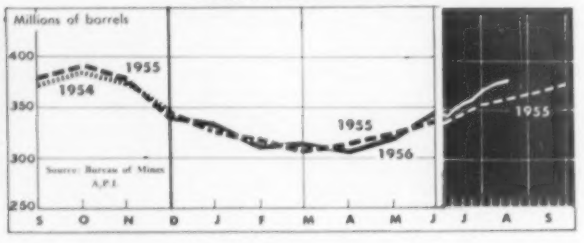
(Thousands of barrels)			
	8-11-56	8-4-56	8-13-55
Pennsylvania Grade	2,526	2,488	2,801
Other Appalachian	2,427	2,432	1,954
Illinois, Indiana, Michigan	10,436	10,485	11,652
Nebraska, North Dakota	2,131	2,905	2,046
Kansas	8,441	18,641	7,969
Oklahoma	27,395	27,102	21,788
Arkansas	2,716	2,851	2,795
Louisiana	16,001	16,840	16,331
North	2,472	2,624	2,810
South	13,529	14,216	13,521
Mississippi	3,255	3,265	2,919
New Mexico	8,378	7,993	8,072
Texas	122,451	123,442	124,542
East Texas proper	9,280	9,179	10,007
West Texas	58,782	59,597	57,269
Texas Gulf	23,069	23,055	24,895
Other Texas	31,320	31,611	32,371
Wyoming	20,024	20,447	14,490
Other Rocky Mountain	6,835	6,838	5,546
California	27,352	27,337	30,271
Foreign	†14,021	15,156	11,341
Total	274,389	‡278,222	264,517

*Bureau of Mines. †Includes 4,114,000 bbl. in California. ‡Revised.

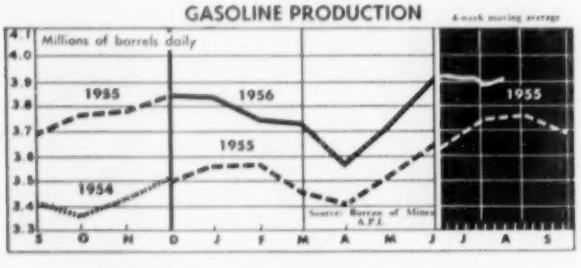
REFINERY RUNS



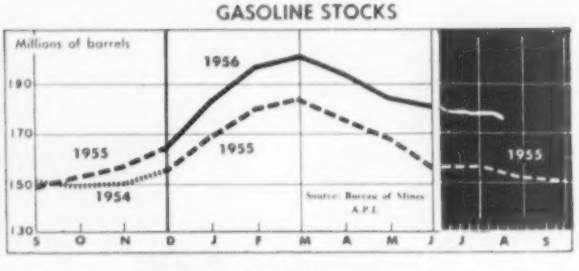
FOUR-PRODUCT STOCKS



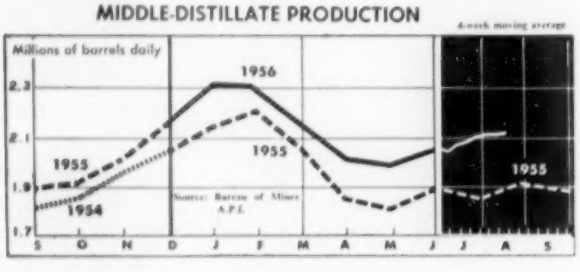
GASOLINE PRODUCTION



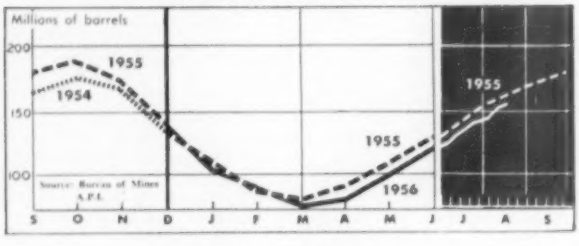
GASOLINE STOCKS



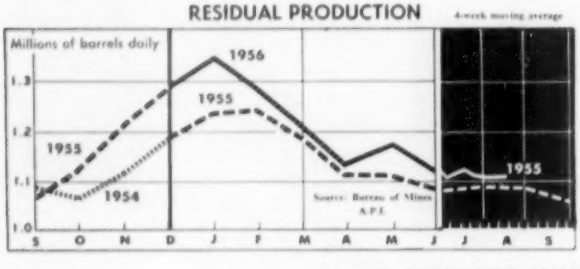
MIDDLE-DISTILLATE PRODUCTION



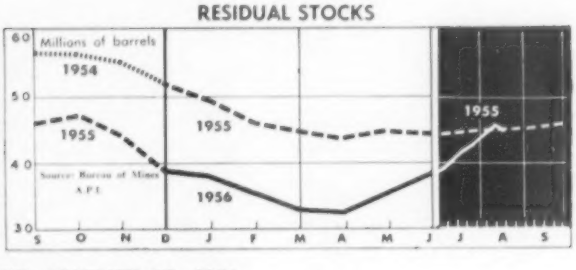
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, AUGUST 17, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1955 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,151	503.4	21.9	300.5	187.9	42,122	11,438	44,677	11,980	1,056	454.6	23.4	268.0	193.0
Appalachian:														
District 1	91	34.6	3.7	19.6	4.6	4,371	529	2,877	534	92	38.1	3.8	21.7	5.0
District 2	97	42.3	4.4	17.0	11.9	2,871	767	957	525	100	56.4	2.6	11.5	13.2
Ind., Ill., Ky.	1,402	711.6	61.2	287.3	148.7	31,286	6,739	18,436	5,415	1,372	735.2	65.8	263.1	146.6
Minn., Wis., Dak.	68	33.9	6.1	17.8	4.4	6,553	1,394	7,345	241	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	703	374.3	16.3	168.6	22.0	15,341	1,859	12,182	1,446	686	389.6	15.3	157.8	20.7
Inland Texas	275	195.0	12.4	50.6	26.1	6,889	586	1,776	1,566	257	181.3	8.4	51.3	20.8
Texas Gulf Coast	1,968	948.3	133.7	480.0	251.2	24,322	3,795	16,374	6,520	1,864	887.8	102.0	436.7	256.3
La. Gulf Coast	710	361.7	48.0	202.8	67.0	9,562	2,353	6,494	1,682	676	341.2	41.7	173.3	48.7
N. La. and Ark.	99	38.4	7.9	22.0	6.1	4,865	550	1,825	174	94	35.9	7.3	22.6	5.8
Rocky Mountain:														
New Mexico	22	11.1	0.3	3.6	2.4	423	9	92	18	21	11.4	0.2	3.7	3.2
Other Rocky Mt.	276	129.1	4.0	59.6	38.3	5,914	384	3,164	886	278	130.0	3.7	58.0	37.3
West Coast	1,037	526.1	4.1	183.0	357.4	21,683	314	12,735	14,009	1,084	511.2	5.3	152.9	399.5
Aug. 17, 1956	7,899	3,910.3	324.0	1,812.4	1,128.0	176,202	30,717	128,934	44,996	7,580	3,772.7	289.5	1,620.6	1,090.1
Aug. 10, 1956	¶7,985	¶3,952.0	344.4	1,760.1	1,122.7	177,557	29,632	124,173	45,541					
Aug. 19, 1955	7,505	3,815.9	311.3	1,564.7	1,116.3	155,563	33,557	125,222	46,349					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois and Kentucky. ¶Revised.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.25-11.75
Premium (96 octane)	13.25-13.75
Gulf Coast (cargoes for coastwise or export movement):	
★ Regular (90 octane)	11.00-11.50
★ Regular (92 octane)	11.25-11.75
★ Premium (97 octane)	12.75-13.25
★ Premium (98 octane)	13.00-13.50
California—Los Angeles (rack):	
★ Regular (84 octane)	12.6-13.3
★ Premium (93 octane)	14.7-15.3
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grades 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.125
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.50

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bulker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
★ Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	2.90
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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(Latest reported spot fixtures)

★N.W.I.-U.S.N.H., dirty (Scale +85%) (31s. 4d.)	$4.36
★ N.W.I.-U.K., clean (Scale +90%) (61s. 9d.)	8.60
★ Sidon-U.S.N.H., dirty (USMC +32.5%)	10.34
★ P.G.-U.S.N.H., dirty (USMC +45%)	18.42
★ Lebanon-U.K., dirty (Scale +140%) (68s. 0d.)	9.47

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One M-58 Bethlehem powered by 2 LRO Waukesha engines

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CARDWELL MODEL "S", double drum with WAK Waukesha, 87 foot Moore mast, folding platform, substructure; Emsco 7½ x 14 pump with two WAK Waukesha; rotary, block, hook, kelly, swivel, BOP, light plants, tool house, bunk house, miscellaneous equipment. Box 3246, Corpus Christi Texas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
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Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

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CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

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1—800# 20 MMCF Absorber with Scrubber, etc.
1—6 Cyl. Buda Engine, 243 H.P. at 900 RPM with Starting Engine.
1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.
2—20 MMCF LTX Units.
Vessels, Generators, Pumps, Instruments, Pipe, Valves, and Fittings and Other Equipment necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

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COMPLETE POLY UNIT, BUILT 1950
UOP RATED 144 BBL./DAY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
20—Brown fintube exchangers, 600# 140 sq. ft. 4-6 chrome.
20—Brown fintube exchangers, 600# 11, 21, 77, 101, 140 sq. ft.
5—Adm. Heat Exchangers, 644, 424, 346, 176 sq. ft.
1—5' x 96' tower, 40 tray, 135# WP.
1—6' x 34' Vacuum tower, 150#.
1—2' x 50' tower, 24 trays.
5—Welded tanks, 10' x 40', 10' x 30', 5' x 20'.
7—Oilfield boilers, 100 hp., 275#.
1—Ethyl lead plant.
2—Convection furnaces, 20 MIL BTU/hr.
1—Vapor phase cracking furnace.
12—Welded storage tanks, 5,000, 2,000, 1,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18; 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
30—Duplex piston pumps, all sizes.
1—10' x 30' asphalt still.
6—Steel Bldgs., 20 x 150, 20 x 20, 20 x 40.
1—BS&B Oil and gas separator, 10.7 mcf, 3500 Bbl./day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

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10—Kellogg Adm. Fltg. Hd. 2700, 2200, 1800 Sq. Ft.
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2 Worth LTC-6 800 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

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6—Adm. 785, 742, 425 sq. ft. ht. exch.
30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
800 ft. of 2" 4-6 ch pipe.
Large quantity of 410 SS chrome strips and sheets.
Tremendous selection stainless steel and steel valves ½"-6".
BJ hot oil pump 3 x 9, 13 st. 325 gpm. 4600' hd.
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126,000'—4½" O.D. x .156" Wall (7.25 lb.) API 5L Grade B DRL PEB Electric Weld Pipe—Tested 1500 lbs.—F.O.B. Mill Pittsburgh.

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Tulsa, Oklahoma Phone: TEmple 5-7601

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The above can be furnished: T&C or P.E. B.F.W. located Tulsa.
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STEEL PIPE & TUBING

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Widest Range of Sizes & Specs in the U. S.
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20,000' 2⅜" Used Seamless Upset Tubing
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15,000' 2⅞" Used Line Pipe T&C
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A wide range of sizes in New and Used Oil Field Tubular goods available.

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143 Joints 4256'9" of 5½" 21.90# Grade D Youngstown API IUE R-2, Seamless Drill Pipe (New), Complete with 143 7" OD x 4" ID Hughes API Full Hole Counter Bore Welded Tool Joints.

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Oklahoma City 2, Oklahoma
Phone: Regent 9-0511

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41,000 FEET 4½" O.D. New Seamless Pipe weight 15.20 per foot 1035 steel High Pressure located Sherman, Texas. Price reasonable. Also good used seamless 5½", 7", 8", 10" casing and tubing, also good used line pipe various sizes. Lun-Dow Company, Box 1215, Tulsa, Phone LU 5-8850.

32,000 ft., 6⅝ in. Drlg. PE	18.97
70,000 ft., 4½ in. Drlg. PE	10.97

No. 1, used, machine cleaned and straightened.
7,000 ft., 6⅝ in. Drlg. PE, .188 Wall, new, single wrap coating.
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Model 702CC Morflex Flexible Couplings $15.00 ea. Complete.
6" 500# WP WOG Wheatley IBBM NRS Flanged Gate Valves, $50.00 ea.
FOB Houston, Tex.
HALLORAN EQUIPMENT CO.
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Houston 20, Texas
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Misc. Sizes 2" to 4½" OD Line Pipe #1 Used. Available for inspection and immediate delivery out of inventory.
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36-I, BUCYRUS-ERIE Machine now drilling at Morton Grove, Ill. Milaeger Well Drilling Co., 1245 N. 62 Street, Milwaukee, Wisconsin. Phone GLenview 3-1230.

1 MODEL N-4 Brewster Double Drum with 2—WAKU Waukesha Engines, 7¼ x 12 FXZ. Gardner-Denver Pump unitized with 1 NKR Waukesha, 94' Lee C. Moore Mast, 6' Substructure, Steel Mud Pits, 5000' 4½" Drill Pipe, 21 Drill Collars. Iverson Supply Company, Odessa, Texas. Phone: FEderal 7-2349.

4" NEW STANDARD Line Pipe 10.79# C.W. Beveled Ends Tested 1200# PSI, SRL, 80,000'. Prices right for immediate sale and delivery. Contact Box J-692, The Oil and Gas Journal, Tulsa, Oklahoma.

P.R.I. SCINTILLATORS
Latest models; guaranteed
1—New 118B Royal Scintillator
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Sacrifice Prices
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THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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30,000 ft. of J-55 Seamless 5½" casing like new. Immediately available Tulsa area. Dealer protected. Contact:
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IMMEDIATE DELIVERY
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35,000'	5½" OD 13#	E.W.	RANGE 2	8 RD. THRD
18,000'	5½" OD 14#	SMLS.	RANGE 2	8 RD. THRD
12,000'	5½" OD 17#	SMLS.	RANGE 3	8 RD. THRD
50,000'	6⅝" OD 18#	E.W.	RANGE 3	8 RD. THRD
25,000'	7" OD 20-23-26#	SMLS.	RANGE 2-3	8 RD. THRD
1,500'	9⅝" OD 32-30#	SMLS.	RANGE 2	8 RD. THRD
8,000'	9⅝" OD 40#		RANGE 2-3	8 RD. THRD
60,000'	2⅜" OD EUE TUBING	E.W.	RANGE 2	8 RD. THRD
30,000'	2⅜" OD EUE TUBING	SMLS.	RANGE 2	8 RD. THRD
25,000'	2⅞" OD EUE TUBING	SMLS.	RANGE 2	8 RD. THRD

Other items line pipe, casing and tubing available, contact.
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Wilson "Titan" Drawworks with Airtube Drum Clutches, Vacuum Transmission Clutches, Automatic Catheads, 36" Single Hydromatic Brake and Sectional 3-Engine Compound with Manual Clutches and Dual Pump Drive. Good Condition. A Bargain at $5,500.00. (Located at Andrews, Texas.)

EMSCO AE-4 Swivel. Overhauled. Price $1,250.00. (Located at Farmington, New Mexico.)

Rotary Rig Accessories Including: Tool Houses, BJ Tongs, Drill Pipe and Drill Collar Slips, Drill Collar Safety Clamp, Drill Pipe and Casing Elevators, Weight Indicator, Measuring Device, Shale Shakers, Water Pump, etc. (Located Odessa, Texas and Farmington, New Mexico.)

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Distributors for CF&I — Lone Star — Pittsburgh — Wheeling
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SMALL MACHINE and Welding Shop with portable equipment all in good condition. Gale Kelly, Cement, Oklahoma.

36-L BUCYRUS-ERIE with 5 and 7 in. tailing-in tools; dog house; light plant, butane tank. 101 So. Vine, Cleveland, Okla. Phone 614.

SACRIFICE due to illness, Ruska Vertical Magnetometer, used very little, price $1,000. Box J-631, The Oil and Gas Journal, Tulsa, Oklahoma.

LINE PIPE: 5000' 8" od, 17 lb., and 2000' 6⅝" ID, 17 lb. Both items 40' random lengths, clean, straight beveled, ready to lay. Both items $1.00. M. J. Regan Pipe Co., Coffeyville, Kans.

R. L. CARDWELL two-drum drilling in unit, good condition, large dog house; light plant; junk rack; 1,000 gallon Butane tank; tools for 5 and 7 inch hole; good lines. First check for $10,000 gets it. Write or phone John Richard, McClelland Hotel, Wichita, Kansas.

HELP WANTED

PROCESS ENGINEER: To assist Sales Department of expanding independent oil company with wide variety of petroleum problems. Primary emphasis on crude and refined product quality evaluations for foreign markets. Require resourceful young man with 3-5 years refinery experience. Location San Francisco with infrequent short trips to Europe and Asia. Please submit experience and salary resume. Confidential. Box J-684, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Major Oil Company has openings in Production Dept. in Venezuela for a number of graduate petroleum engineers.

OPENINGS also for petroleum, mechanical and chemical engineers for work in drilling, pipeline and gas depts. Salary commensurate with experience.

Please send details of Experience to:

P. O. BOX NO. 35
BOWLING GREEN STATION
NEW YORK 4, N. Y.

PETROLEUM ENGINEERS

Experienced graduate engineers for immediate openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

RESERVOIR FLUID ANALYST

With degree in Physical Chemistry or Chemical Engineering plus 5 years' petroleum production engineering experience which should include 2 years' study of reservoir fluid behavior.

Salaries commensurate with training and experience. Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 116

ARABIAN AMERICAN OIL COMPANY

505 PARK AVENUE
NEW YORK 22, N. Y.

HELP WANTED

DRILLING SUPERINTENDENT—Age 29-39. Experienced drilling engineer needed for work abroad. Live in town of a million population. Living expenses of family paid. Tax-free salary $15,000 bracket. Experience in oil field transportation and logistics. Box J-676, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

GOOD OPORTUNITY with company newly active in foreign work—MUD ENGINEER Age 25-35. Top ability petroleum engineer with three years Gulf Coast experience with drilling mud problems and general oil field operation. Salary $12,000 tax free, plus living expenses. Box J-677, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

(Ages 25 - 38)

RESERVOIR and PETROLEUM PRODUCTION ENGINEERS are needed in the expanding organization of major U. S. oil company operating in South America. Vacancies exist for graduate petroleum, chemical or mechanical engineers at levels requiring five to ten years of pertinent experience. Salary, including bonus, approximately $14,000-$17,000 depending on qualifications and experience. Liberal employee benefits and home vacations with travel expenses. Send complete resume of personal data and work experience. Replies will of course be confidential and personal interviews will be arranged for qualified applicants.

BOX 480, DEPT. Y-21, NEW YORK 19, N. Y.

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SAN FRANCISCO CALIFORNIA

Offers engineers liberal relocation allowances from the point of employment to the engineering office in San Francisco. These allowances include transportation for you and your family plus moving allowances for your household furnishings.

PIPELINE ENGINEERS
SENIOR ELECTRICAL
SENIOR MECHANICAL

San Francisco opportunity for senior electrical or mechanical engineers with experience on oil pipeline and pumping stations or gas pipeline and compressor stations.

Send resume to Manager of Employment & Placement
Industrial Relations Division

BECHTEL CORPORATION

220 Bush Street
San Francisco 4, Calif.

For an immediate personal interview you may phone:

Paul Keating, Murray Hill 7-7100, New York City
Joe Braddick, FAirfax 3-2401, Houston, Texas
Bill Milligan, TUcker 1549, Los Angeles, Calif.
Don Palmer, DOuglas 2-4032, San Francisco, Calif.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

PETROLEUM ENGINEER—2 to 3 years experience in drilling and production by aggressive independent. Unusual opportunities for qualified man. Furnish resume of experience and education, all replies confidential. Corpus Christi area. Reply to Box J-695, The Oil and Gas Journal, Tulsa, Oklahoma.

THE AIR TECHNICAL Intelligence Center has reported immediate position openings for petroleum fuels and lubricants engineers at salaries to $8990 per annum. The positions stress the ability to evaluate petroleum refining processes; to construct flow charts and material balances. The applicant must be familiar with the chemistry of petroleum process as well as the construction and design of refinery facilities. Those with knowledge of foreign languages will be given additional consideration. Applications should be addressed to: Commander, Air Technical Intelligence Center, ATTN.: AFOIN-4X2b, Wright-Patterson Air Force Base, Ohio.

DRILLING ENGINEERS
FOREIGN DRILLING OPERATION

Oil well drilling contractor has immediate opening for drilling engineers in Sicily and Africa. Liberal salary and bonus. Box J-679, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER

Strong, active independent oil company with diversified production in U.S.A. and Canada has excellent opportunity for a graduate engineer having 3-5 years of experience in reservoir analysis. Location—head operations office, South Texas. All replies confidential. Send details of education and experience, with an idea of salary expected, to

Box J-688,
The Oil and Gas Journal,
Tulsa, Oklahoma.

Wellsite and Subsurface GEOLOGIST

For small independent oil company operating in Ecuador, South America Require 2 to 4 years experience. Excellent living conditions. Send full particulars on education and experience with references to:

JAMES L. CARLTON
P. O. Box 455
CASPER, WYOMING

VALUATION ENGINEER

Petroleum Engineer with experience in appraisal and reservoir work wanted by permanently established independent oil company. Position requires practical as well as technical knowledge in the evaluation and financing of producing property purchases, and in administrative procedure. Must have the ability and initiative to develop necessary contacts in the active regions of the oil country. Reply should state age, education, experience, active references, and starting salary required.

BOX J-690,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla. Tom Robinson, owner. Send brief resume education, experience, age, family status.

NEWLY ORGANIZED oil corp. has position open for geologist in West and West Central Texas. Send complete resume of experience (min. five years) and include salary requirements. Box J-696, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER — over one year experience. Train as assistant to General Sales Manager of Oil Tool corporation. Unusual opportunity for advancement while receiving top salary. Submit education and experience details. Our employees know of this ad. P. O. Box 7288, Houston 8, Texas.

WANTED SUB-SURFACE GEOLOGIST: Independent oil company has opening in Illinois for sub-surface geologist with 3 to 5 years experience. Must be familiar with tri-state area. Exceptional opportunity for aggressive man. Applicant should supply complete resume of education, experience, qualifications, references, and salary expected. All replies confidential. Reply Box J-681, The Oil and Gas Journal, Tulsa, Oklahoma.

NEED REPRESENTATION IN THE OIL COUNTRY

If you make a specialty or a standard line for the oil country, and desire good live representation in the Mid-Continent area, with oil business experience, acquaintance and "know-how", let us tell you how we can build up your sales.

BOX J-694,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOPHYSICIST

Major Oil Company in Venezuela seeks capable individual of directing technical end of seismic crew operations; make independent interpretations. Single man with 3 to 5 years experience preferred. Please send details of experience and education to:

P. O. BOX 735
Bowling Green Station
New York 4, New York

PRODUCTION SUPERINTENDENT

Independent oil company has opening for experienced Production Superintendent familiar with Mid-Continent operations, preferably engineer graduate. Must have excellent background and practical working experience. Age limit 50. Give full particulars as to qualifications, age, past employment, and references. Reply

BOX J-693,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

SITUATIONS WANTED

PRODUCTION MAN: Married, age 39, 15 years experience. Best of reference. Box J-689, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM EXPLORATION GEOLOGIST: desires responsible position with medium sized, independent, or integrated oil company. Eight years of diversified exploration experience in West Texas-New Mexico Area with major. Capable of evaluating and working up all types of geological prospects and trend plays. Thoroughly experienced in contouring regional and field maps. Box J-671, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, ten years broad experience, desires connection with independent or financial backing. Complete resume upon request. Oil Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla.

PRODUCTION FOR SALE

FOR SALE—5 oil wells in Brown County, Texas. Full ⅞ lease, on 160 acres. Depth 1200', water flood successful in same area. Now producing 13 bbls. Producing from sand, estimated 85% oil still in place. Box 428, Kilgore, Texas.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

LEASE AND DRILLING BLOCKS

40 ACRES & WELL DRILLED $1500.00 for ½ interest. Center of oil producing area, Coweta Field. L. Price, Coweta, Okla.

FOR SALE: 50 acre lease Southern Okla., 10 acres drilled, 7 wells 15 bbls. day, 6 pumping, all subject sandfracing with good results. Approx. 700 ft. 7" 24 lb. pipe, 1000 ft. 2" tubing, 1000 ft. ⅝ rods, 25 Horse Fairbanks-Morse central power, 16 x 16 lease house, new Jensen pumping unit, seperate machine with Roper pump on pipe line. Box J-687, The Oil and Gas Journal, Tulsa, Oklahoma.

GET SHALLOW production with bigger profits on it; I have the structures for such; you can buy them. N. M. Sauls, Geologist, Cookeville, Tenn.

North Chaves County, N. M.

Recommend to small or large buyers leases & royalty in Major Company blocks. Drilling or to drill. Developments indicate great potential possibilities. Data on request.

W. J. PETERMAN, GEOLOGIST
Exploration 1918-1956 Engineering
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LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

The following described producing oil leases MUST BE SOLD TO SETTLE ESTATE

No. 1 HENDRICKSON LEASE, E/2 NW/4 Sec. 25 T27 R8, Greenwood County, 2 mi. E, 1 mi. N, ½ E, 1 mi. N of Beaumont, Kansas. Four producing wells, 1 disposal. Producing from Peru sand; suitable for flooding. Room for additional wells, depth 1850', settled prod. approx. 4 bbls. daily per well. Wells furnish sufficient gas to run pumping engines.

No. 2 HARRIS LEASE: S/2 NW NE NW Dec. 24 T 24 R 12E Greenwood County, 3 mi. W, 1 mi. S, 1 mi. W, 1 mi. S, Virgil, Kansas. Mississippi lime well approx. 1715' daily prod. approx. 3½ bbls. On pipeline, electrically equipped.

No. 3 ANNA BOYER LEASE: NEc NE/4 Sec. 34 T25 R10 Greenwood County, 1 block E of tracks in Eureka, Kansas, on US54 and 6 blocks N on Cecil Jones place. Mississippi lime well, 1900'. Approx. prod. 5 bbls. daily. On pickup oil line, electrically equipped.

No. 4 LODGE LEASE: Block 5, Highland Park Addition to City of Eureka, Kansas, 2 blocks E of tracks on US54 and 2 blocks N. 1910'. Daily prod. approx. 5 bbls. On pickup oil line, electrically equipped.

For further information write or call Lloyd K. Jones, Box 128, Emporia, Kansas, Phone 680; or Mr. John Day Darrah, Legal Bldg., Wichita, Kansas, Phone Amhurst 2-7469.

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OFFERING CHOICE ROYALTIES ahead of drilling, in major company blocks. You can make small investments. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

WANTED

WANTED: Leases for drilling. Consider outright purchase or give override. Give legal description and geology, if available. Box J-685, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED — Drilling and/or Production deals in Kansas and Oklahoma. Contact Fell & Wolfe Oil Co., Box 348, Tulsa.

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY. Periodic reports—maps—newsletter. Mail: VOSA, Apartado 3963, Caracas. Cables: VOSA, Caracas. Telephone 544802. Neal VanMiddlesworth.

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REAL ESTATE FOR SALE

FOR SALE: A beautiful home of nine rooms, two baths, guest house, completely furnished including boat. Located on shore of Flathead Lake in Montana. Excellent swimming, fishing, hunting and scenery. For further information contact H. H. STANLEY COMPANY, Great Falls, Montana.

DOWN TOWN LOCATION Casper, Wyoming. Office building, warehouse and material yard, all or part. Casper Realty Company, 300 North Center, Phone 2-7345, Casper, Wyoming.

MOTELS, Income and a choice assortment of Wyoming's best cattle ranches. Casper Realty Company, 300 North Center, Phone 2-7345, Casper, Wyoming.

FOR LEASE: Lafayette, La., Entire air conditioned second floor, area 7500 square feet, triple A building, on the most prominent corner in the city. Suitable for high class business or offices. Will lease all, or part. Call or write. E. Ostrich, 810 Jefferson St., Phone CE 54528.

PLAT SHEETS

NEW KRAFTBILT PLAT SHEETS will solve your plotting problems. Choose from a broad selection of sizes, scales and paper types. Contrasting lines are sharp and clean. Bond, ledger and tracing papers are top quality. Our line is complete! Ask for Bulletin 356-W. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

PRODUCTION WANTED

WANT TO BUY—Oil Properties, settled or semi-settled production, 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

GEOLOGIST WILL INVEST to $20,000 and services for part interest in small oil exploration, service, or producing company. Reply Box J-691, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL CONTACT. Will consider placing proposition requiring corporate financing on Underwriting basis. Confidential. Write Consultant, 817 51st St., Brooklyn, N. Y.

If interested in favorable leases, royalties or in drilling deals
Write
R. E. "BUCK" CLEMENT
Box 65 Norman, Oklahoma

PETROLEUM PRODUCTS

PETROLEUM PRODUCTS

NOTICE

The National Iranian Oil Company offers for sale, during the year 1957, a total quantity of 3,660,000 long tons of Iranian Light Crude Oil in following quarterly quantities F.O.B. Bandar Mashur.

	U.S. Barrels	Long Tons
First Quarter	6,683,000	890,000
Second Quarter	6,840,000	910,000
Third Quarter	6,919,000	920,000
Fourth Quarter	7,076,000	940,000
	27,518,000	3,660,000

Main characteristics of the Crude Oil offered are:

Average Specific Gravity @ 60°F	0.8530 (34.39° A.P.I.)
Sulphur % Wt.	1.3 - 1.4%
Vapour Pressure	6.5 - 8.0 lbs. at 100°F
Salt Content	5.2 lbs. approx. per 1000 bbl.

Those interested are requested to indicate:

1. Price offered per barrel of 42 U.S. Gallons f.o.b. Bandar Mashur.
2. Quantity of crude oil required.
3. Period during which the required quantity will be lifted.
4. Currency in which payment will be effected. (Preference being given to payments in currencies of international convertibility).
5. Whether the purchaser is prepared to put up a performance bond.
6. Whether the purchaser would arrange for vessels carrying crude oil to be bunkered by the National Iranian Oil Company.
7. Banks to which reference can be made.

This offer is open until September 30th, 1956, and the National Iranian Oil Company will notify its acceptance or rejection of the proposals received before the 30th November, 1956.

The National Iranian Oil Company is also prepared to consider offer for long term contracts for the purchase of Iranian Light Crude Oil.

Proposals may be directed to the National Iranian Oil Company, Teheran, or to the Iranian Embassies, Legations, or Consulates abroad.

NATIONAL IRANIAN OIL COMPANY

Successful Wildcats

ALBERTA

Hudson's Bay 1 Northwest Cessford, LSD 6, 36-25-15w4. TD 3,908 ft. Viking gas well.

Hudson's Bay 1 East Eaglesham, LSD 11, 35-78-25w5. TD 8,071 ft. Dual zone, Gething and Cadomin gas well.

CALIFORNIA

Kern County: Beach, Church and Bell, operators, 1 Scherrer, NW SE 36-26s-18e, IP 3,000 M.c.f., perfs. 3,344-49 ft., TD 3,835 ft. (New gas field discovery 1½ miles south of Blackwells Corner oil field.)

MICHIGAN

Arenac County: DuLong Oil Co. G-1 Gordon, S½ SW NE 34-19n-3e. Traverse lime 2,050 ft., pay 2,340-50 ft., 25 BOD, pay 2,340-50 ft. TD 2,500 ft., PBTD 2,451 ft. (New pay Adams pool.)

EAST TEXAS

Red River County: Millsap Oil Co. 1 Sam Williams, 2½ miles northeast of Fullbright on the James Graham Sur. IPP 10.4 BOPD, perfs. 2,368-71 ft., Paluxy, 36°, GOR 20:1. TD 2,400 ft. (Oil discovery.)

SOUTH LOUISIANA

Calcasieu Parish: Sohio Petroleum Co. 2-B Sweet Lake, 30-10s-6w. IP 207 BCPD

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 3,061.71 acres of land in fifteen parcels within the known geologic structure of certain fields in Eddy, Lea and San Juan Counties, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, October 16, 1956, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. Douglas E. Henriques, Manager.

and 3,936 M.c.f. daily, adjustable choke, 60°, perforations 9,736-46 ft. TD 12,085 ft. (New pay in Bell City field.)

Jefferson Parish: Humble Oil & Refining Co. 1 State Lease 2914, Elmwood Canal area, Block 37, Lake Pontchartrain. IP 60.24 BOPD and 1,611 M.c.f. daily, ⅞-in., 36.2°, perforations 7,488-92 ft.

Lafourche Parish: The Texas Co. 1-C Bay de Chene Unit-State Lease 357 and 1217, 18-19s-24e. IP 228 BOPD and 1,160 M.c.f. daily, ⅝-in., 40°, perforations 15,220-35 ft. TD 17,211 ft. (New pay and extension Bay De Chene field.)

Plaquemines Parish: Richardson & Bass 1-E Humble-Libandois et al, Unit B, 18-17s-14e. IP 114 BOPD, ⅛-in., 26°, GOR 763 cu. ft. per barrel, perforations 10,796-10,805 ft. TD 12,500 ft. (New pay and extension in Pointe-a-la-Hache area.)

NORTH TEXAS

Grayson County: A. H. Bruner & Co. 1 Walker, T. Toby Sur., A-1248, 5 miles N Whitesboro. IPP 121 BOPD, 31°, GOR 220, pay 6,474-86 ft. TD 7,440 ft.

Jack County: J. C. Man, Jr. 1 Hill, T. Toby Sur., A-857, 3 miles S Antelope. IPP 65 BOPD, 43°, GOR 400, pay 3,700-06 ft. TD 3,830 ft.

Wise County: K & H Operating Co., Christie, Mitchell & Mitchell 1 John Wilkinson, John Richie Sur., A-717, 1 mile E Crafton. IP 148 BOPD, 14/64-in., TP 440 psi., 40°, GOR 600, conglomerate 5,741-76 ft. TD 5,879 ft.

Charles H. Kadane 1 Sipes, Robert Townsley Sur., A-813, 6 miles SW Chico. IP 124 BOPD, 18/64-in., TP 650 psi., 44°, GOR 830, pay 5,450-86 ft. TD 5,783 ft.

Young County: Taubert & Steed 1 Cox, Blk 13, Young CSL Sur., A-1284, ¼ mile E Markley. IPP 100 BOPD, 40°, GOR 375, pay 3,535 ft. TD 3,549 ft.

SOUTHWEST TEXAS

Bastrop County: A. W. Gregg 2 J. H. Carrol estate, A. Mays Sur. IPP 33.60 BOPD (net) with 70 BWPD, 37.1°, perforations 2,252-63 ft. TD 2,340 ft. (New Serpentine plug field—Carrol.)

TEXAS GULF COAST

Harris County: Meredith & Co. and Bradco Oil & Gas Co. 1 Hieden, B. Page Sur., A-618. IP 52,000 M.c.f. daily, open-flow potential, GLR 101.4 M.c.f. per barrel, 61°, perforations 6,188-94 ft. TD 6,350 ft. (Extends Bammel field 1 mile northwest.)

Wharton County: Anderson & Cooke 1 Wittig, WCRR Sur., A-588, Shut-in gas well, no gage, perforations 4,441-46 ft. TD 5,210 ft. (Extends North Louise field.)

WEST CENTRAL TEXAS

Eastland County: Ehrhart & Arnot 1 Hamilton, Sec. 3, HT&B Sur., ½ mi. N Olden. IPP 72 BOPD, 41°, GOR zero, sand pay 2,400-08 ft. TD 2,652 ft.

Nolan County: Dave R. Harris 1 Feldman, 199-1A-H&TC, 8 mi. W Maryneal, 2 mi. NW extender to Vena Madre field. IPP 75 BOPD, 40°, GOR 150, Strawn 6,932-38 ft. TD 7,286 ft.

Stonewall County: Jake L. Hamon 1 Green, 138-D-H&TC, 7 mi. N Aspermont. IP 89 BOPD, 14/64-in., TP 75 psi., GOR 625, 41°, Bend conglomerate perforations 6,205-11 ft. TD 6,500 ft. Suggested field name, Gloria Gay-Bend conglomerate.

WEST TEXAS

Ector County: Stanolind Oil & Gas Co. 1 Fasken "AK," 33-42-T1N-T&P, 12 miles NW Odessa. IPP 9 BOPD, plus 16 bbl. water, gravity and GOR not reported. Pay 7,384-98 ft. TD 12,485 ft.

Upton County: Wilshire Oil Co. of Texas 25-98 Jacobs Livestock Co., Sec. 98, William Patterson Sur., Devonian pay opener in Heluma field, 11 miles SE Crane. IP 512 BOPD, 20/64-in., TP 700 psi., GOR 986, 41.7°, perforated 8,705-8,825 ft. TD 11,100 ft., PB 8,900 ft., ground elev. 2,984 ft.

Shell Oil Co. 15 Dora Roberts, 793-D-J. H. Gibson, Wolfcamp pay opener in Wasson field, 8 miles NW Denver City. IPP 222 BOPD, 41°, GOR 100, pay perforated 8,448-8,568 ft. TD 11,351 ft., lowest marker, Simpson 11,140 ft., pre-Cambrian 11,330 ft., elev. 2,692 ft.

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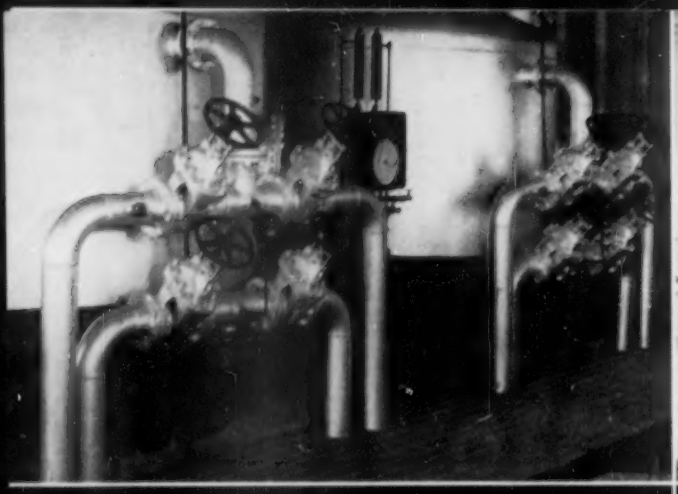

2-8′ x 5′ 40 PSI W.P. National Filters in Illinois Water Flood

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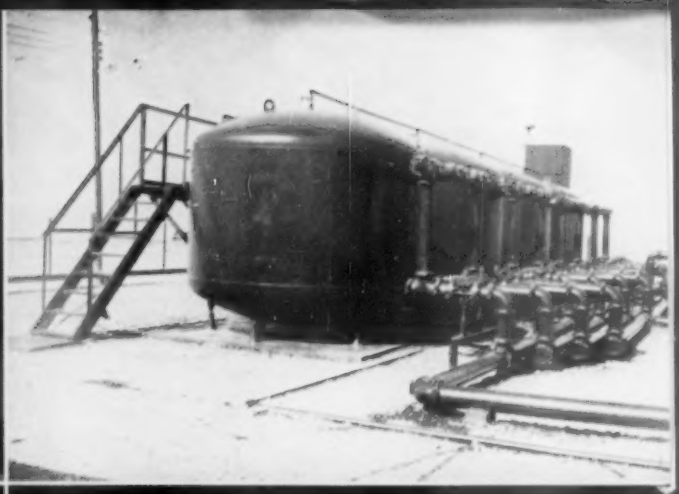

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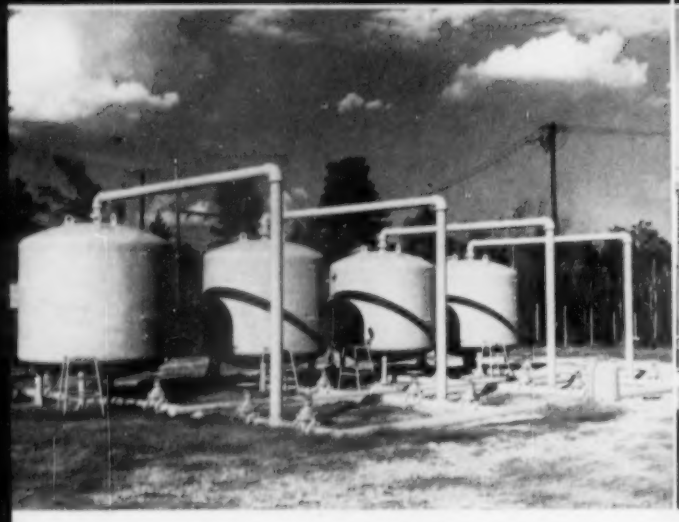
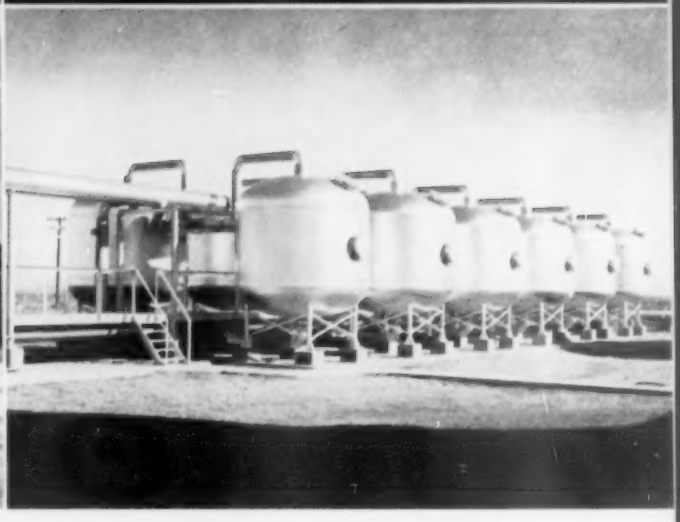
Battery of 200 PSI W.P. National Filters in West Texas Water Flood





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